

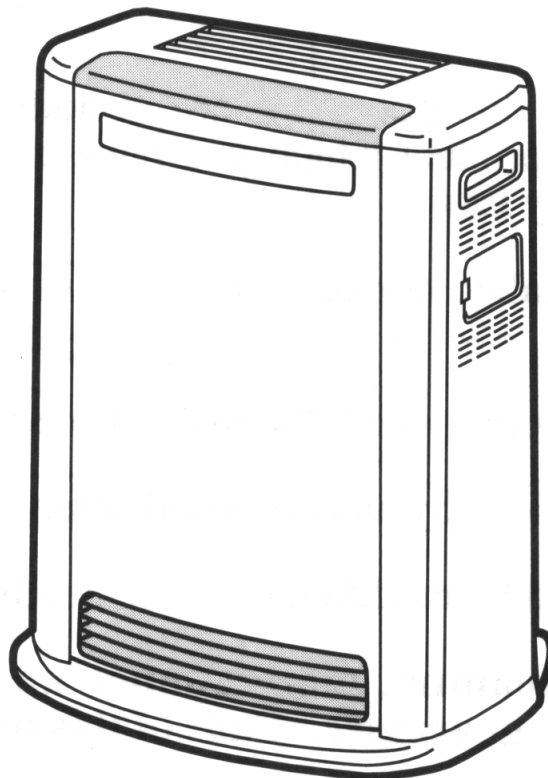
# **Rinnai**

## **SERVICE MANUAL**

### **RCE-460PTR**

### **RCE-560PTR**

## **FAN CONVECTOR**



Proudly a member of The Australian Gas Association.  
All of our products are AGA tested and approved.



The Australian  
Gas Association



**Quality  
Endorsed  
Company**

ISO 9002 Lic 4983  
Standards Australia

Distributed and serviced in Australia under a  
Quality System certified as complying with ISO  
9002 by Quality Assurance Services.

Rinnai New Zealand has been certified to ISO 9001  
Quality Assurance by Telarc.



**Quality  
Endorsed  
Company**

ISO 9001 Reg 415



Comparative Energy Consumption tested to The  
Australian Gas Association requirements of  
Australian Gas Code AG 103. An energy rating of  
5 stars refers to an efficiency of approximately 80%,  
that is, 80% of gas consumed is converted to useful  
heat.

The Regulatory Compliance Mark (RCM)  
indicates compliance with electrical safety  
regulations in Australia and New Zealand  
Rinnai Australia Supplier Code 5109



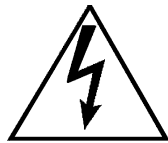
- ISO 9001** *Model for Quality Assurance in design/development, production, installation and servicing, aimed primarily at achieving customer satisfaction by preventing nonconformity at all stages from design through to servicing.*
- ISO 9002** *Same as ISO 9001 but excluding design.*
- AG 103** *Approval requirements for gas heaters as set by The Australian Gas Association and Australian Liquefied Petroleum Gas Association Ltd, to ensure proper safety performance and quality levels are achieved.*

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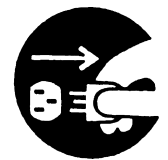
### **Key to Warning Symbols**



Failure to comply with the following instructions may result in serious personal injury or damage to the appliance.



Be careful of possible electric shock. Wiring inside this appliance may potentially be at 240 Volts.



Remove the plug from the source when carrying out any of the following activities.



Read Fault Diagnosis and Wiring Diagram carefully to avoid incorrect wiring



Do not disassemble. Parts within cannot be exchanged or diagnosed faulty.

Please follow instructions from page 47 carefully to ensure safe and appropriate service.

After completing the service and confirming that there are no water or gas leaks or incorrect wiring, test operation of unit according to the Customer Operating Instructions.

After confirming normal operation, explain what was serviced to the customer and operation principles if necessary.

This manual has been compiled by Rinnai Australia Customer Technical Services. While many individuals have contributed to this publication, it will be successful only if you - the reader and customer - find it useful. We would like to extend an invitation to users of this manual to make contact with us, as your feedback and suggestions are valuable resources for us to include as improvements. Rinnai are constantly working toward supplying improved appliances as well as information, and specifications may be subject to alteration at any time.

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## ***Glossary of Terms***

This glossary of terms and symbols is provided to assist you in understanding some of the language used throughout this manual.

dB(A)	-	sound pressure level in decibels, “A” range
DC	-	direct current
AC	-	alternating current
Hz	-	Hertz
IC	-	integrated circuit
kcal/h	-	kilocalorie per hour
kPa	-	kilopascals
LED	-	light emitting diode
mA	-	milliamps
MJ/h	-	megajoule per hour
mm	-	millimetres
OHS	-	overheat switch
PCB	-	printed circuit board
CPU	-	central processing unit
POT	-	potentiometer
rpm	-	revolutions per minute
SV	-	solenoid valve
∅	-	diameter
Δ °C	-	temperature rise above ambient
POV	-	modulating valve
TH	-	thermistor

# 1. Introduction

---

## Development Background

Rinnai have developed a Portable Convectector/Air Purifier Space Heater with an air purifying capacity that exceeds existing models and meets recent aims to improve health. We recommend that replaceable parts and the location of the unit be changed yearly.

## Features

- Air Purifier
  1. Removes cigarette smoke, pollen, household dust and other micro-particles.
  2. Use of the anti-bacterial and deodorising filter creates a comfortable space to live in (filter indicator shows when it needs to be replaced.).
  3. The dust sensor shows how clean the air is in a room.
  4. The automatic function changes its operational level according to the cleanliness of the air in the room. There are four levels of adjustment for manual operation.
  5. The OFF Timers can be set in three steps.
  
- Heater
  1. The various safety devices, fault history display, etc. are the same as the existing models.
  2. “TR” model features dual ON/OFF Timer, remote control, economy mode, clock display & child lock.

## 2. Specifications

Model No.		RCE - 460 PTR		RCE - 560 PTR		
Name of appliance		Portable Convector				
Main Unit Specifications	Output		5.5~18MJ/h (5.0 kW)		5.5~21MJ/h (5.81 kW)	
	Dimensions (mm)	Width	520			
		Depth	210 (base 305)			
		Height	650			
	Weight (Kg)		16.2			
	Connections	Electrical	AC240V 50Hz (NZ : AC 230V)			
		Gas	Approved gas hose			
	Electrical Consumption (W)	Heating	High: 38 Low :31 (NG) 30 (Propane)		High: 39 Low :31 (NG) 30 (Propane)	
		Air Purifying	Boost:27 High:22 Med:21 Low:20			
		Heat & Air Purifying	Max:56 Min:41 (5 on standby)			
Heating Capacity		45m <sup>3</sup>		52.5m <sup>3</sup>		
Air Purifying Capacity		45.6 m <sup>3</sup>				
Comb. Specifications	Gas Input (MJ/h)	Gas Type	460PTR		560PTR	
		NG	HI	18	HI	21
			LO	5.5	LO	5.5
		LPG	HI	18	HI	21
	LO		6	LO	6	
	Main Burner	Form	Slit type			
		Method	Bunsen type			
Air Filter		#30 Mesh				
Heater Specifications	Operation	Operation	Push Button			
		Ignition method	Continuous spark, Main Direct Ignition			
	Control	Room temperature	(Low-approx.10° C)16~26° C(High-Continuous High)			
		Gas flow control	High~Low (Modulating Control) 12-step automatic changeover			
	Warm Air Outlet		Bottom front of unit			
	Air Volume (m <sup>3</sup> /min)		460PTR: 2.5~3.5		560PTR: 2.5~3.9	
	Air Flow Changeover		High ~ Low (12 step automatic changeover)			
	Convection Fan		Line flow type ø 110x 328L			
	Convection Fan Motor		Condensor line 4 pole motor			
Filter Indicator		Thermistor 65° C ON				

Air Purifier Specification	Air Purifier	Filter method (initial efficiency approx. 80%)	
	Anti-bacteria	Activated Carbon (initial efficiency approx. 75%)	
	Operation	Push button	
	Operation Changeover	Automatic Operation (High/Med/Low) and Manual Operation (Boost/High/Med/Low)	
	OFF Timer	3 step changeover (1, 2, 4 hour)	
	Louvre Location	Top of appliance	
	Airflow (m <sup>3</sup> /min)	Boost 3.3, Hi 2.2, Med 1.8, Lo 1.4	
	Air Purifier Fan	Sirocco Fan φ 160 x 80L	
	Air Purifier Fan Motor	Condensor line 4 pole motor	
	Dust Sensor	Particle Counter (scattered light method)	
	Filter Replacement Indicator	Calculated as on page 18	
Safety Devices	Incomplete Combustion Device	Thermocouple method	
	Flame Failure	Thermocouple method	
	Reverse Flame Device	Bi-metal method OFF 150± 5° C ON 125± 10° C	
	Overheat Device	Thermistor level 4~ 12 70° C level 1~ 3 70° C	Thermal fuse 216° C OFF
	Power Failure Device	Within PCB unit	
	Tilt Switch Device	Steel Ball Method (within PCB unit)	
	Over-current Protection	3-amp fuse	
	Loose Primary Filter Detection Device	Micro-switch	
Other	Available gas types	NG, LPG	
	Electrical Frequency Converter	50Hz only	
	Replacement Filter	HEOT - 003	



### 3. Combustion Specification

#### Basic Combustion Specification

Rinnai model reference		RCE-460PTR			RCE-560PTR		
Gas type		NG	Propane	LPG(NZ)	NG	Propane	LPG(NZ)
Gas consumption (MJ/h)	High	18	18	18	21	21	21
	Low	5.5	6	6	5.5	6	6
Main injector size		φ 2.15	φ 1.40	φ 1.40	φ 2.15	φ 1.40	φ 1.40
Thermocouple spacer	A	1	1	1	1	1	1
	B	0	0	0	0	0	0
	*B	0	0	0	0	0	0
Restrictor		φ 20	φ 22	φ 22	φ 20	φ 22	φ 22
Regulator pressure (kPa)	High	0.65	1.46	1.46	0.85	1.91	1.91
	Low	7	18	18	7	18	18
Burner marking		X3C	X3P	X3P	X3C	X3P	X3P
Combustion method		Bunsen burner					
Burner type		Slit					
Solenoid valve		Direct Single Seated Valve Type					
Modulating solenoid valve		Rinnai Electronic Control					

\* Level decided by gas type setting.

## Warm Air Discharge Temperature Distribution - 560PTR (Heater)

Conditions: <High Combustion>

Test gas: Natural  
 Measured Input: 20.90 MJ/h      4,990 kcal/h  
 Nominal Input: 21.00 MJ/h      5,020

(Unit  $\Delta^{\circ}\text{C}$ )

56	75	76	72	75	68	61	61
70	82	75	80	85	78	61	72
56	81	71	81	94	85	61	74
60	80	66	79	90	86	61	74
54	77	64	79	89	87	58	71

(Average 73.1)

(Room temperature 26.0 $^{\circ}\text{C}$ )

Conditions: <Low Combustion>

Test gas: Natural  
 Measured Input: 5.40 MJ/h      1290 kcal/h  
 Nominal Input: 5.50 MJ/h      1310

(Unit  $\Delta^{\circ}\text{C}$ )

22	26	27	26	26	25	24	23
25	30	27	28	31	29	24	28
22	31	27	30	36	32	24	29
23	32	27	33	39	34	24	29
22	33	27	33	41	35	23	29

(Average 28.4)

(Room temperature 26.0 $^{\circ}\text{C}$ )

## Warm Air Discharge Velocity - 560PTR (Heater)

<High>

(Unit m/sec)

2.91	2.91	3.31	3.99	3.46	2.79	2.76	1.88
3.39	3.52	3.67	4.31	4.13	3.34	3.12	1.64
3.53	3.94	4.29	4.29	4.30	3.77	3.61	2.58
3.87	4.40	4.19	4.23	4.76	4.09	3.48	3.16
4.34	4.28	3.83	4.96	4.61	4.60	3.40	3.45

(Average 3.68)

<Low>

(Unit m/sec)

1.54	1.72	1.87	2.68	1.67	1.49	1.86	1.17
2.22	2.41	2.39	2.62	1.98	1.84	2.35	1.08
2.12	2.64	2.60	3.14	2.77	2.50	2.41	1.63
1.68	1.95	2.37	3.10	3.04	3.10	2.10	2.30
3.02	2.89	2.41	3.10	3.11	2.96	2.30	2.54

(Average 2.32)

Conditions

Convection Fan rpm

High: 840 rpm

Low: 550 rpm

Measured at full combustion

Average air velocity on High: 3.68 m/sec

Average air velocity on Low: 2.32 m/sec

Area of louver: 0.018 m<sup>2</sup>

Air flow rate on High: 3.97 m<sup>3</sup>/min

Air flow rate on Low: 2.51 m<sup>3</sup>/min

## Warm Air Discharge Temperature Distribution - 460PTR (Heater)

Conditions: <High Combustion>

Test gas: Natural  
 Measured Input: 18.10 MJ/h      4,320 kcal/h  
 Nominal Input: 18.00 MJ/h      4,300

(Unit Δ°C)

53	67	68	63	65	63	55	54
63	74	66	69	71	72	54	65
52	74	62	69	79	79	55	65
53	74	58	70	78	82	54	67
52	72	56	69	80	85	51	66

(Average 65.6)

(Room temperature 26.0°C)

Conditions: <Low Combustion>

Test gas: Natural  
 Measured Input: 5.40 MJ/h      1290 kcal/h  
 Nominal Input: 5.50 MJ/h      1310

(Unit Δ°C)

22	26	27	26	26	25	24	23
25	30	27	28	31	29	24	28
22	31	27	30	36	32	24	29
23	32	27	33	39	34	24	29
22	33	27	33	41	35	23	29

(Average 28.4)

(Room temperature 26.0°C)

## Warm Air Discharge Velocity - 460PTR (Heater)

<High>

(Unit m/sec)

2.58	2.58	2.93	3.53	3.07	2.47	2.44	1.66
3.00	3.12	3.25	3.81	3.66	2.96	2.76	1.45
3.13	3.49	3.80	3.80	3.80	3.34	3.20	2.29
3.43	3.89	3.71	3.74	4.22	3.62	3.08	2.80
3.84	3.79	3.39	4.39	4.08	4.08	3.01	3.06

(Average 3.26)

<Low>

(Unit m/sec)

1.54	1.72	1.87	2.68	1.67	1.49	1.86	1.17
2.22	2.41	2.39	2.62	1.98	1.84	2.35	1.08
2.12	2.64	2.60	3.14	2.77	2.50	2.41	1.63
1.68	1.95	2.37	3.10	3.04	3.10	2.10	2.30
3.02	2.89	2.41	3.10	3.11	2.96	2.30	2.54

(Average 2.32)

Conditions

Convection Fan rpm

High: 800 rpm

Low: 550 rpm

Measured at full combustion

Average air velocity on High: 3.26 m/sec

Average air velocity on Low: 2.32 m/sec

Area of louver: 0.018 m<sup>2</sup>

Air flow rate on High: 3.52 m<sup>3</sup>/min

Air flow rate on Low: 2.51 m<sup>3</sup>/min

## Air Discharge Velocity (Air Purifier) 460/560PTR

<Boost>

(Unit m/sec)

1.42	1.57	1.27	1.24	2.43	3.73	2.76	1.56	2.73
4.05	4.73	4.13	4.80	4.20	4.90	3.41	4.62	5.30

(Avg 3.27)

<High>

(Unit m/sec)

0.73	0.96	0.96	2.08	1.95	2.62	1.38	1.21	1.80
2.44	3.00	3.09	3.08	2.77	2.84	1.93	2.73	3.13

(Avg 2.15)

<Medium>

(Unit m/sec)

0.57	0.78	0.82	1.88	1.50	1.99	1.57	1.03	1.38
1.85	2.53	2.71	2.72	2.25	2.37	1.77	2.29	2.63

(Avg 1.81)

<Low>

(Unit m/sec)

0.47	0.72	0.82	1.57	1.36	1.48	1.19	0.88	1.28
1.28	1.94	2.33	2.20	1.90	1.89	1.54	1.93	2.00

(Avg 1.49)

Conditions

Air Purifier Fan rpm Boost: 1100 rpm

High: 740 rpm

Med: 670 rpm

Low: 600 rpm

Average air velocity on Boost: 3.27 m/sec

Average air velocity on High: 2.15 m/sec

Average air velocity on Med: 1.81 m/sec

Average air velocity on Low: 1.49 m/sec

Area of louvre: 0.0165 m<sup>2</sup>

Air flow rate on Boost: 3.24 m<sup>3</sup>/min

Air flow rate on High: 2.13 m<sup>3</sup>/min

Air flow rate on Med: 1.80 m<sup>3</sup>/min

Air flow rate on Low: 1.47 m<sup>3</sup>/min

## Noise Level - 460/560PTR

Heater

Operation Noise (dB (A))
High: 41    Low: 27

Measuring method: According to Japanese Industry Standards  
During Combustion

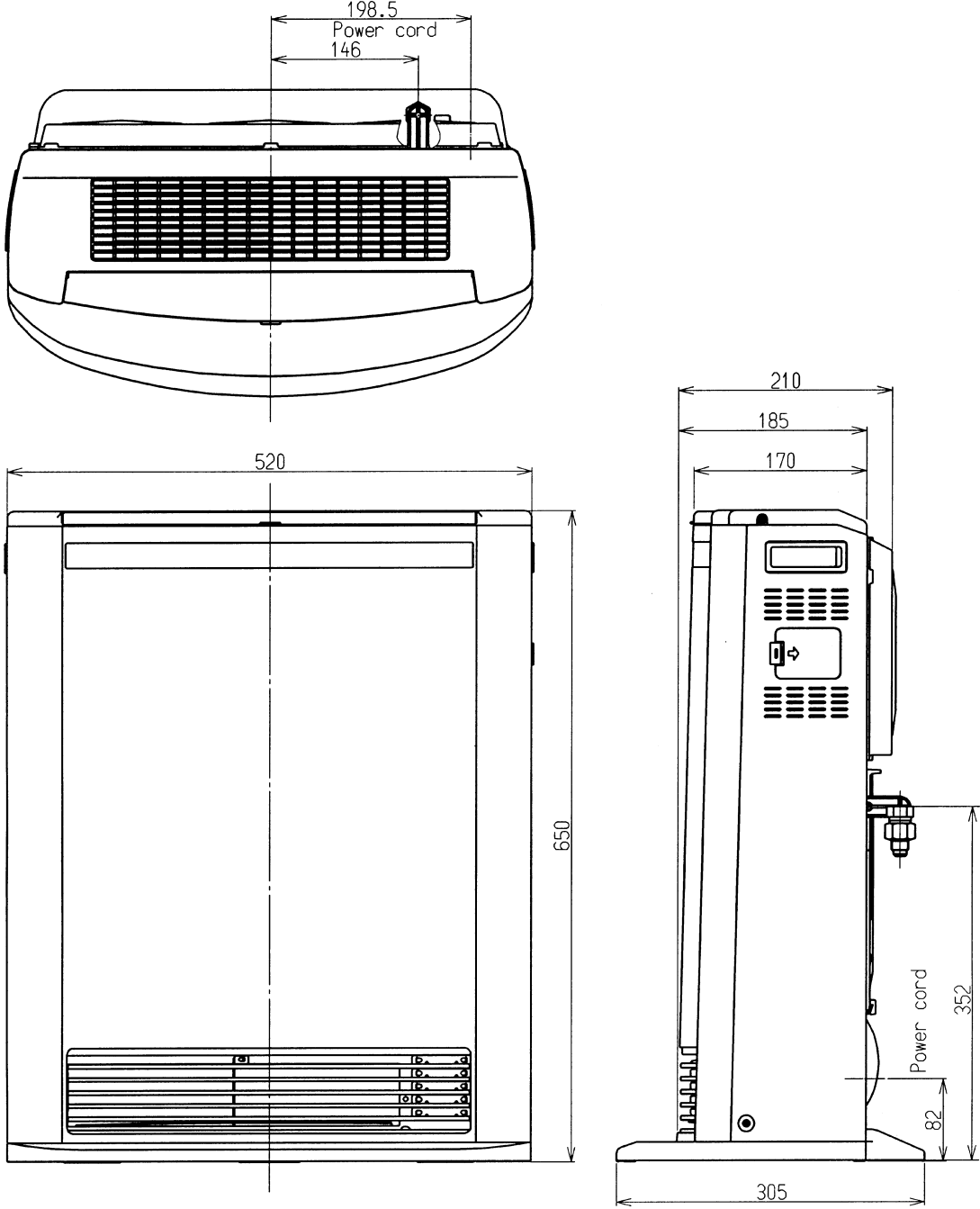
Air Purifier

Operation Noise (dB (A))
Boost: 45    High: 35    Med: 31    Low: 27

Measuring method: According to JEM1467

# 4. Dimensions

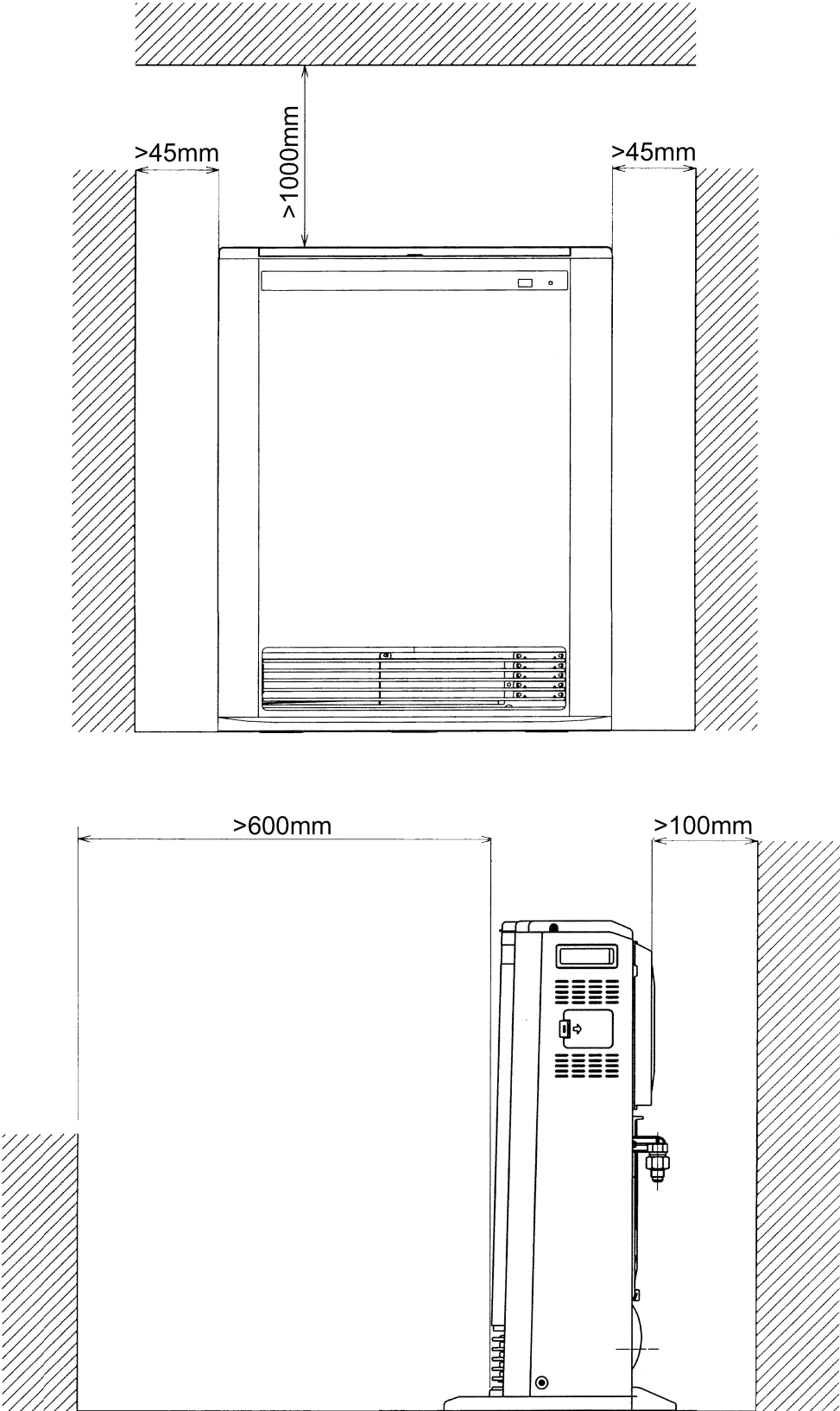
*Note:* All dimensions are in millimetres



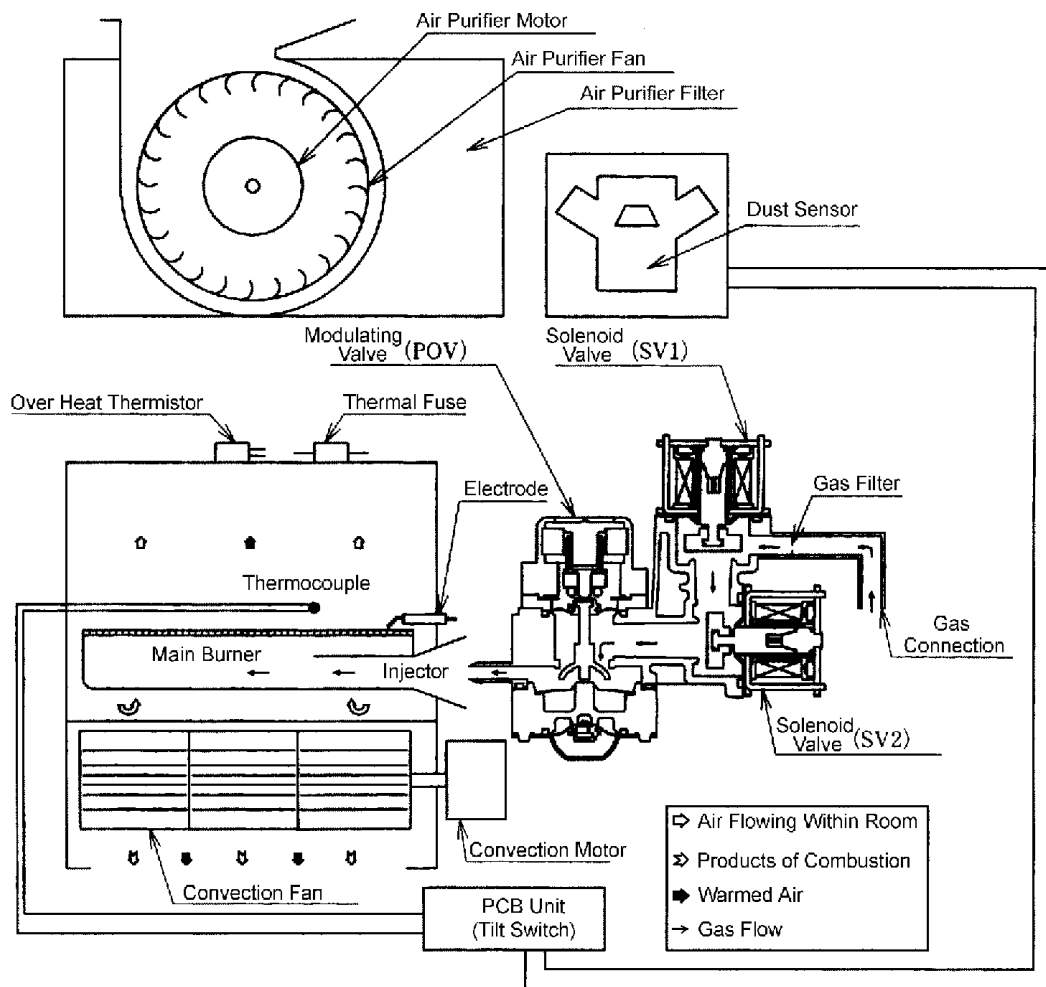


# 5. Installation

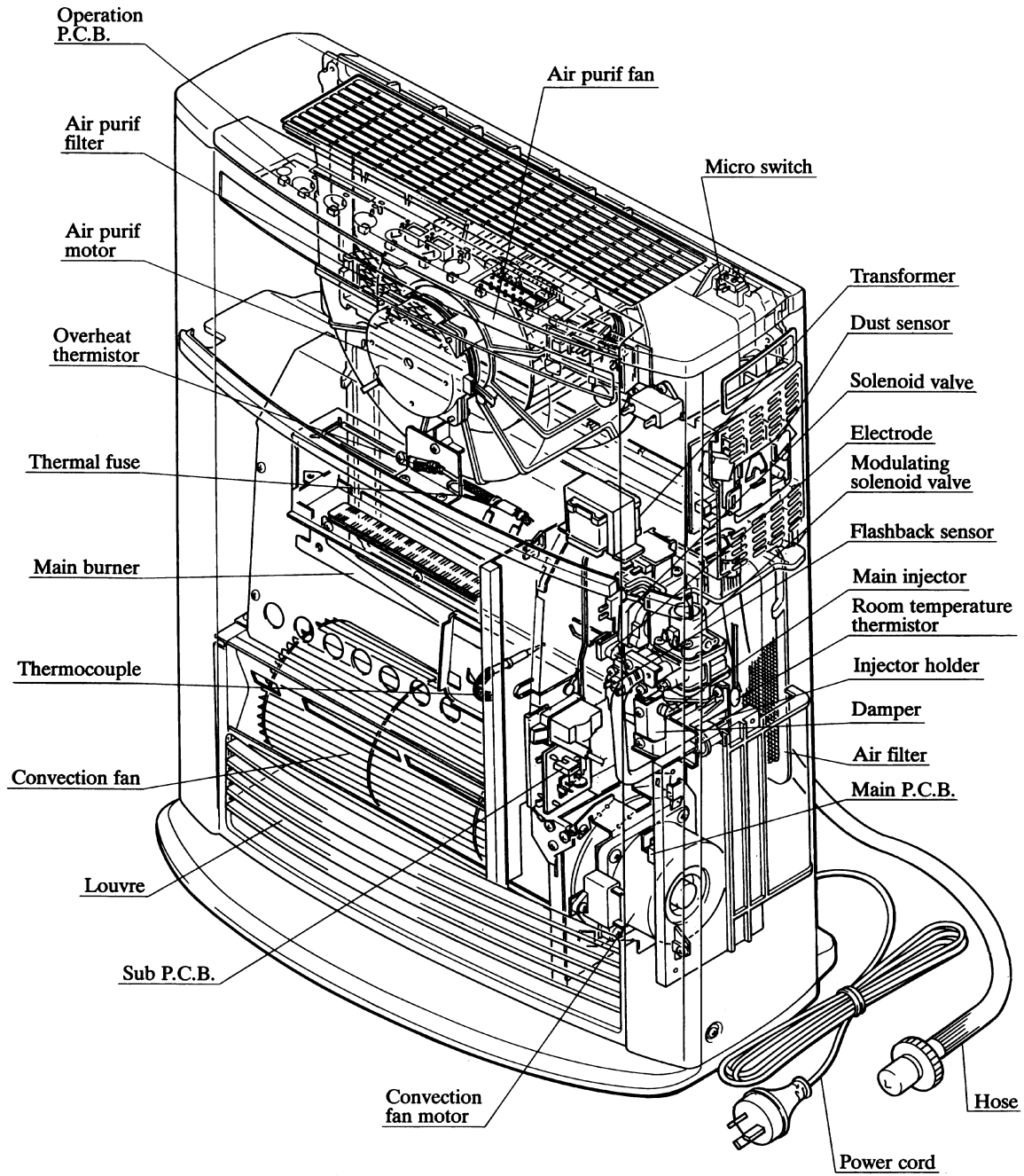
The following clearances are recommended for installation.



## 6. Schematic Diagram

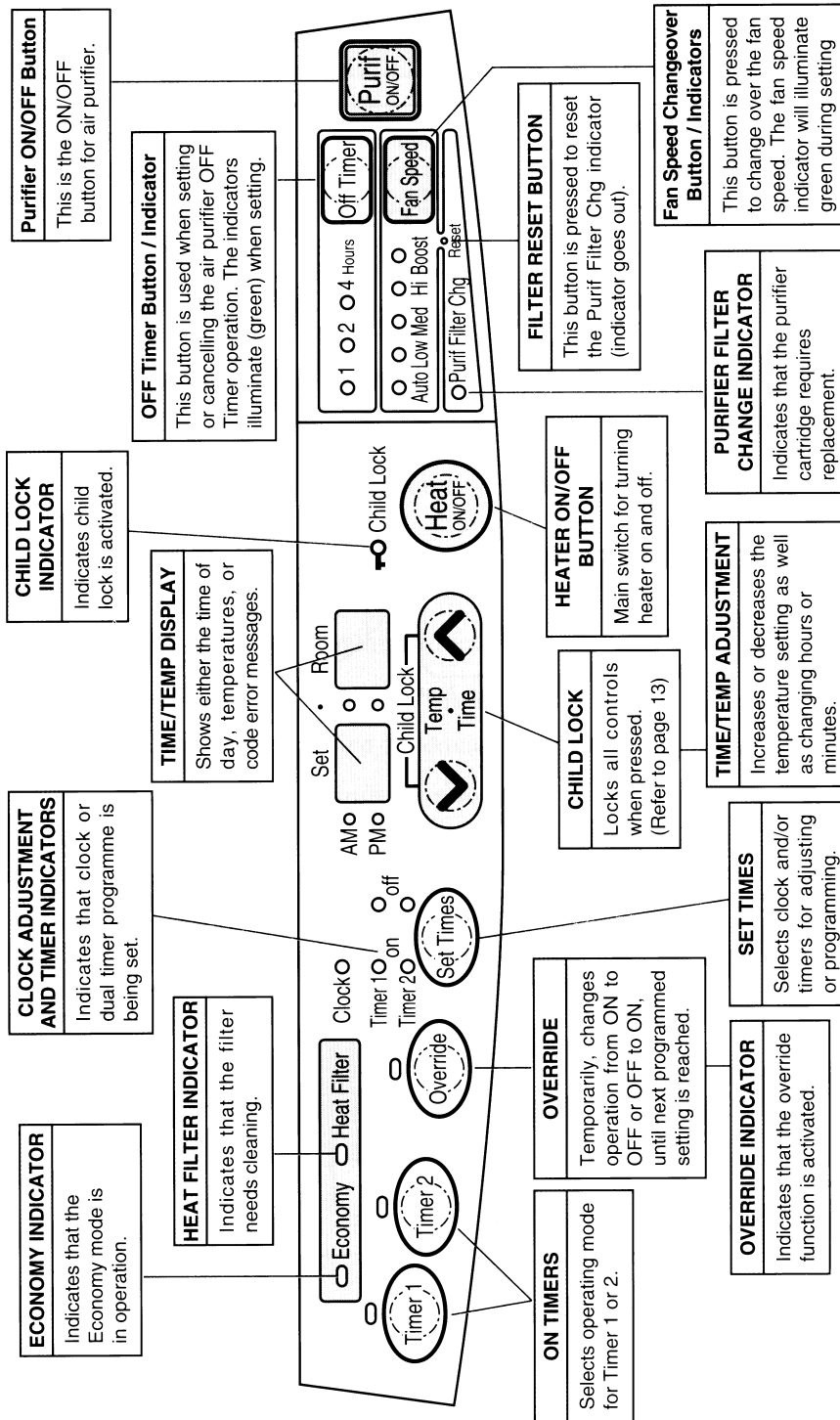


# 7. Cut - Away Diagram



# 8. Operation Principles

## Control Panel Layout



## Normal Heater Operation

- Press the Heat ON / OFF button.
- The ON/Combustion indicator illuminates green, and the convection motor starts pre-purging.
- The Digital Display displays the present room temperature. After approximately 3 seconds, the electrode starts discharging electricity, and at the same time, the solenoid valves and the modulating valve open. After ignition, while the main burner is on “High”, the ON/Combustion indicator illuminates red when the thermocouple detects the flame, and electrical discharge ceases. (Forced combustion is carried out for approx. 60 sec on High).
- The PCB’s micro-computer regulates the room temperature and combustion time, and also controls both using fuzzy logic until the preset room temperature is reached.

## Temperature Control

- Room temperature can be adjusted as desired with the Temp / Time buttons.

## Turning OFF the Heater

- Press the Heat ON / OFF button.
- The solenoids and modulating valve close and combustion ceases.
- The indicators will go out. (The digital display will show the present time.)
- The convection motor stops after post-purging (2~4 minutes).

## Child Lock

- Press the Up and Down buttons simultaneously. The Child Lock indicator will illuminate.
- When setting the lock while heater is operating, only the Heat ON/OFF button responds. When unit is off, the Heater ON /OFF button will not respond. (The Air Purifier can be operated.)
- The Up and Down buttons should be pressed simultaneously for approximately 2 seconds to cancel the Child Lock.

## Clock Setting

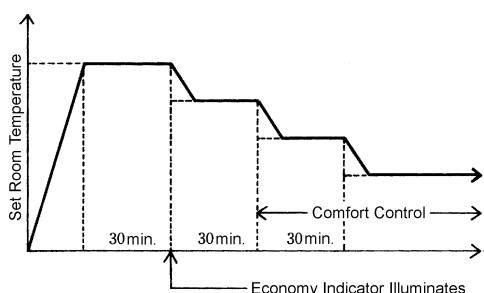
- Press the Set Times button once. The Clock indicator will flash.
- Press the Temp/Time buttons to adjust the time.
- Press the Set Times button five times to set the clock. The indicator will go out.

## Setting Timers 1 and 2 (Heater)

- Press the Set Times button twice. Timer 1 “on” indicator will flash.
- Press the Temp/Time buttons to adjust to the starting time.
- Press the Set Times button again. The Timer 1 “off” indicator will flash.
- Press the Temp/Time buttons to adjust to the finishing time.
- Press the Set Times button three times to lock in the programmed times. The Digital Display will show the current time. (The Timers can also be set during heater operation. In this instance, combustion will cease and the Timer will go into stand-by mode. When in stand-by mode, the set room temperature for the Timers cannot be modified. In order to modify the set room temperature, revert the unit to its normal state, modify the set room temperature and press the Timer button to complete setting.)
- The intelligent function will start the unit so that the room is warm at the set time.
- The Timer operates for the set time then automatically stops. (The Timer indicator starts flashing 5 minutes before the unit ceases operation and continues to flash after operation has ceased.)
- If the same button is pressed twice when the Timer is in stand-by mode, the unit will go into normal OFF mode.

- If the Heater button is pressed when the Timer is in stand-by mode or during combustion, the unit will go into normal OFF mode.

## Automatic-Economy Mode (Heater)



30 minutes after the present room temperature has reached the set room temperature, the Economy function will start operating automatically and the Economy indicator will illuminate.

•After a room reaches the set temperature, the set room temperature will decrease 3 times automatically, each time dropping by a maximum of 1°C in 30 minute intervals.

•If the set room temperature is “L”, “16”, “26” or “H” a few minutes after operation has commenced, the auto-economy function will not activate and the Economy indicator will not illuminate. (However, once the auto-economy function has commenced, the unit will continue to operate in that mode if set to the above temperatures.)

- The increments shown in the table below are based on a temperature gradient which is calculated using the initial room temperature 1 minute after ignition, and the room temperature 5 minutes after ignition. (This is for when the room temperature is set between 17~25°C.)

Increment (°C)		Initial Room Temperature		
		<6.0°C	>6.0°C <16.0°C	>16.0°C
Temperature Gradient	<6.0°C	0.3°C	0.7°C	1.0°C
	6.0°C~8.0°C	0.7°C	0.7°C	1.0°C
	>8.0°C	0.7°C	0.7°C	0.7°C

- Even if the set room temperature is modified while auto-economy is operating, the auto-economy function will continue.
- When the present room temperature is over 5°C less than the set room temperature while auto-economy is operating, the auto-economy function will go into stand-by mode. (The Economy indicator will go out.)

The comfort control alters combustion and fan speed more frequently to counteract the feeling of cold air and activates at the 2nd phase of auto-economy operation, preventing discomfort from overcooling and saving energy.

- The comfort control pattern is determined from within the PCB.
- Like auto-economy, the comfort control does not activate when the set room temperature is “L”, “16”, “26”, or “H”.
- During comfort control when the present room temperature is at least 5°C less than the set room temperature, the comfort control will end and the auto-economy function will go into stand-by mode. (The Economy indicator will go out.)

## Automatic Air Purifier Operation

### 1. Turning ON

- i) Press the “Air Purif” button. The Fan Speed “Auto” indicator will illuminate and the Air Purifier fan will rotate on High. The Dust Indicator will illuminate green.
- ii) After approximately 20 seconds, the fan speed will adjust automatically according to the cleanliness of the air. (The Air Purifier fan will operate at levels High, Med, and Low.) The 3 dust indicators will illuminate according to the degree of uncleanliness of the air in a room. (Red = Exceedingly High, Orange = High, Green = Low.)

### 2. Adjusting the Fan Speed

- i) Adjust to the desired Fan Speed with the Fan Speed button.

### 3. Turning OFF.

- i) Press the “Air Purif” button.
- ii) The Air Purifier Fan will stop.
- iii) The Fan Speed changeover indicator and Dust Indicator will go out.

## OFF Timer (Air Purifier)

- Press the OFF Timer button when the Air Purifier is operating and set the desired time (1, 2, or 4 hours).
- The Air Purifier will turn off after the set time period is lapsed.

## Filter Replacement Indicator

When the air purifier has operated for 4000 hours, the filter replacement indicator (Purif Filter Chg) will illuminate to let you know that the filter needs to be replaced. The operation time is calculated as follows:

Air Cleaning Operation Time =  $1/2$  (Hours of automatic operation) + Hours of manual operation

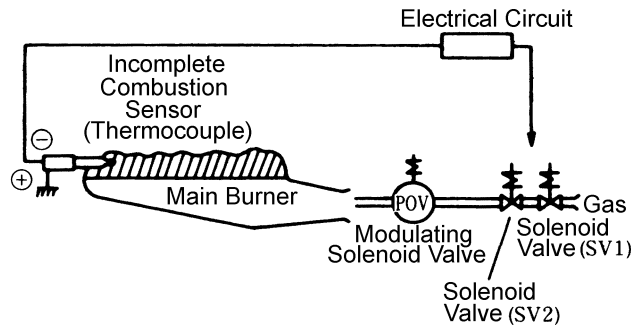
The Reset Button - the filter replacement indicator must be reset by doing the following:

- When the “Purif Filter Chg” indicator is illuminated:  
Press the reset button continuously for approximately 3 seconds to make the indicator go out and to reset the hours of air purifier operation.
- When the “Purif Filter Chg” indicator is out:  
Press the reset button continuously for approximately 3 seconds to illuminate the indicator momentarily (for 0.5 sec) and to reset the hours of air purifier operation.

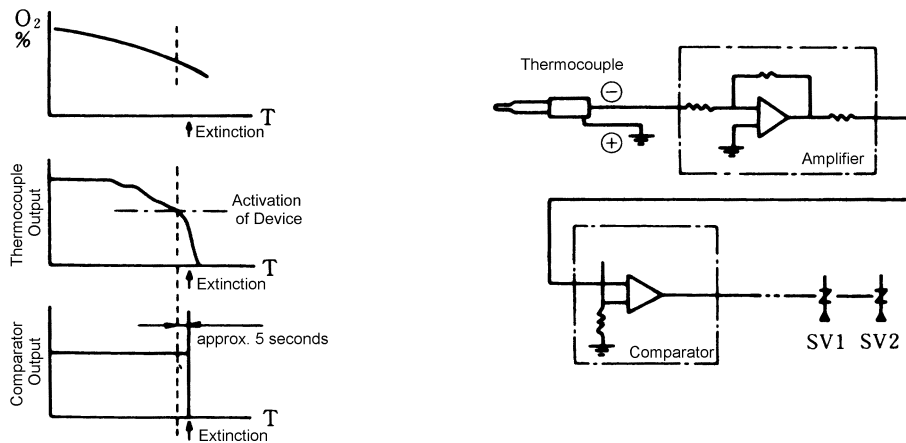
# 9. Main Componentry

## Safety Devices

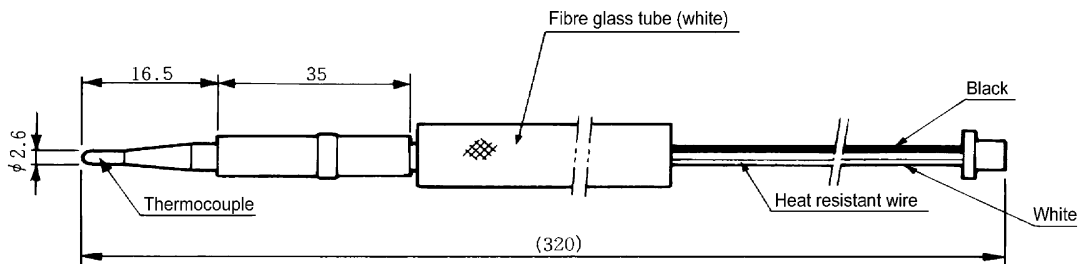
### Incomplete Combustion Prevention



The **Incomplete Combustion Prevention Device** senses flame temperature using a sensor with a thermocouple. Thermocouples are widely used as burner safety devices. The Incomplete Combustion Safety Device is incorporated in a special burner structure connected to an electronic sensor. Ignition, combustion and flame failure are monitored by this system, and main burner abnormal combustion or incomplete combustion due to unclean air are electronically sensed as a thermocouple change from flame temperature change prior to occurrence.



The amplifier amplifies the thermocouple output by a few volts (20 ~ 30 m V) and any changes are checked against the comparator. If the output is lower than the standard voltage of the comparator, the solenoid valve closes.





## Sensor Specification

Ignition Sensing Voltage (mV)	ODS Sensing Voltage (mV)	Thermocouple Output		Drop Out Time (sec)
Output at initial check +2	NG: level 4~12 14±1.5 level 1~3 14±1.5	NG: >18mV LPG: >20mV	<35mV	Below 60
	LPG: level 4~12 16±1.5 level 1~3 16±1.5	NG: >18mV LPG: >20mV	<35mV	

“Drop Out” = Time until the gas is cut off after flame failure.

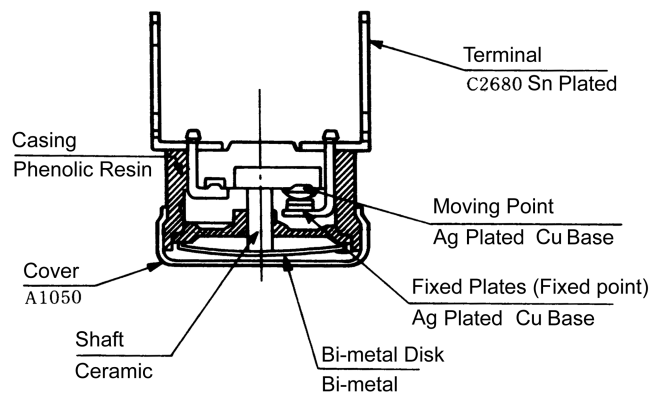
Sensing voltage varies depending on gas type. (Refer to combustion specifications)

## Overheat Switches

If the air filter or air outlet becomes blocked, the overheat switch causes the solenoid valve to close and operation to stop. The appliance can be re-lit when it has cooled. If the air filter or outlet becomes blocked and the OHS fails, the thermal fuse will “blow”, causing the solenoid valve to close and operation to stop. This is a “one-shot” fuse; therefore the appliance cannot be restarted until this fuse has been replaced.

OHS Type	Characteristics	
Thermistor	level 4~12 1~3	Operates at 70° C
Thermal Fuse	Cut Off Temp	216± <sup>0</sup> / <sub>10</sub> ° C

## Reverse Flame Detection Device

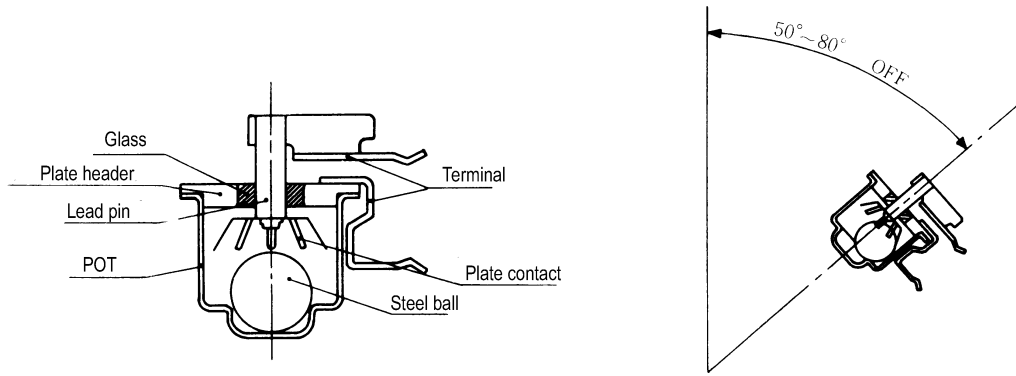


Type	Characteristics		
Reverse Flame Detection Switch (Bi-metal)	Operational Temp.	150± 5° C	OFF
	Reset Temp.	125± 10° C	ON

## Tilt Switch Safety Device

Normally, the tilt circuit is open, but the steel ball rolls when the unit is tilted, closing the circuit.

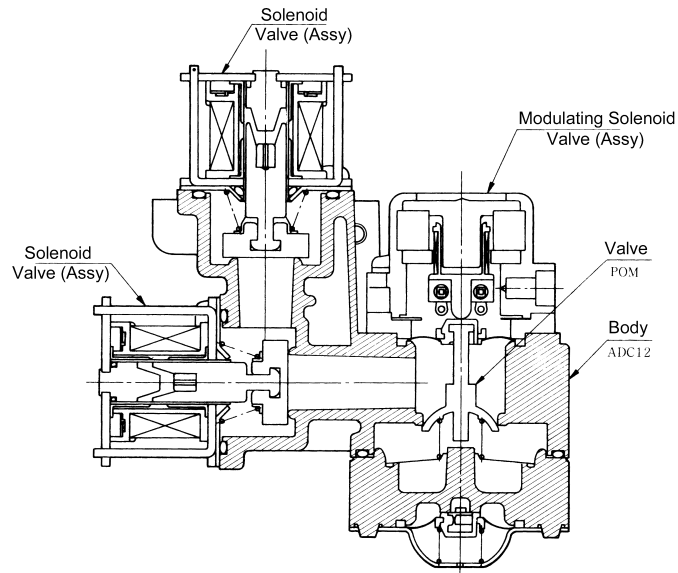
Steel Ball Tilt Switch	Activating Angle	50° ~ 80°
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**Surge Protection**

Glass Fuse	3 Amp
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**Valves**



**Solenoid Valve**

		Solenoid Valve 1	Solenoid Valve 2
Single Seated Valve	Voltage	DC90 V	DC 90V
	Power Consumption	Below 5 W	Below 5 W

**Modulating Valve**

Voltage	<200mA
Consumption	Below 1 W

## Electrical

	Type	Diameter (mm)	Width (mm)	Air flow Rate m <sup>3</sup> /min	Fan (rpm)
Convection Fan	Line Flow Fan	φ 110	328	(Full Combustion) High: 3.5(460PTR), 3.9(560PTR) Low: 2.5	High: 800±70 (460PTR) 840±70 (560PTR) Low: 550±70
Air Purifier Fan	Sirocco	φ 160	80	Boost: 3.3 High: 2.2 Med: 1.8 Low: 1.4	Boost: 1100±100 High: 740±100 Med: 670±100 Low: 600±100

Note: Air flow rate is measured using a duct.

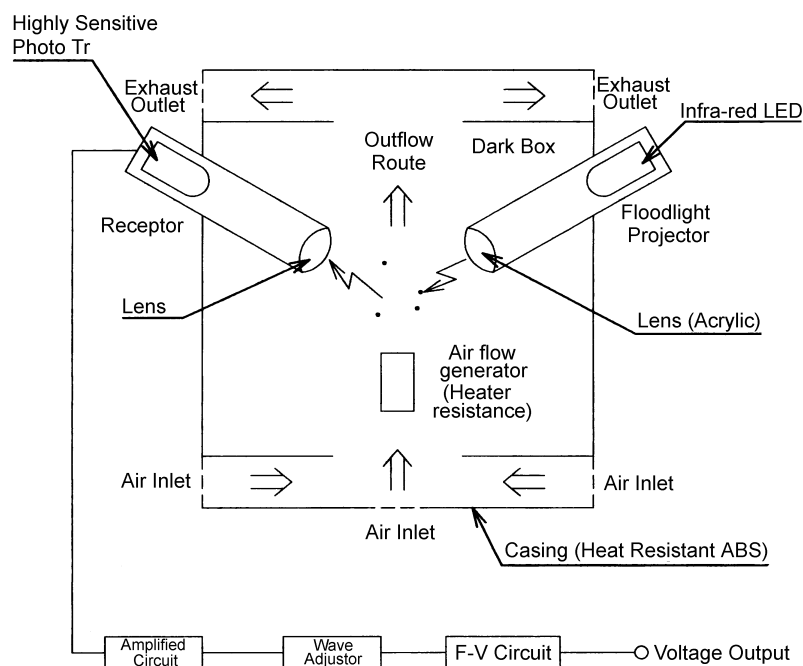
Fan speed is measured using a finished product during air purifier operation.

## Room Temperature Control Device

	Set Temp Range	Room Temp Display Range	Differential
Thermistor	16 ~ 26°C	1 ~ 30°C	Approx. 0.5°C

## Dust Sensor

Input	Detectable Particle Diameter	Detectable Density Range
AC 5V & DC 5V	approx. >1μ m	0~8000/0.01f <sup>3</sup>



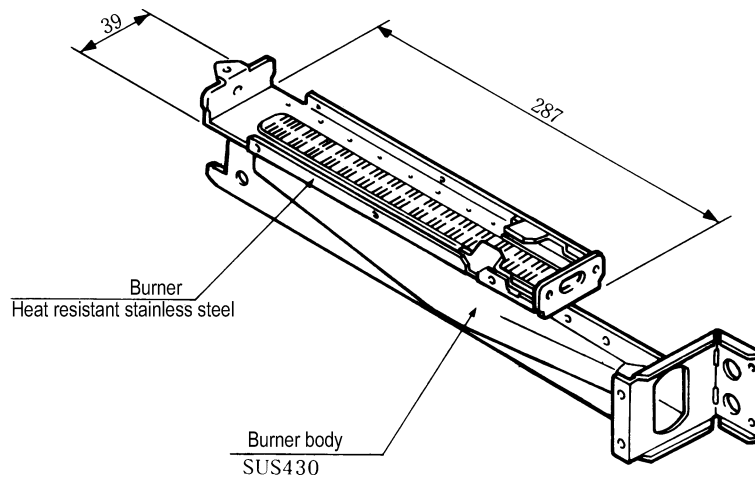
## Operating Principles

1. An air current is created by the heat generated from heater resistance guiding the surrounding unclean air into the area where the detector is.
2. The lens projects infra-red light around the detector.
3. When dust passes through the detector area, infra-red light is scattered, and the sections of scattered light are gathered with the lens into the Photo Tr.
4. The Photo TR converts scattered light into electrical signals. The signal is then processed within the circuit emitting a dust signal.

## Combustion

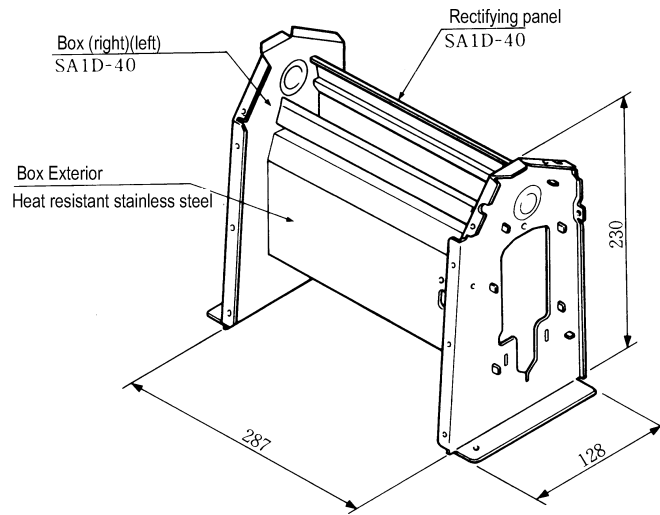
### Burner

Type	Combustion Type	Burner Port Shape	Qty	Material
Main burner	Bunsen	Slit	1	Heat Resistant Stainless Steel

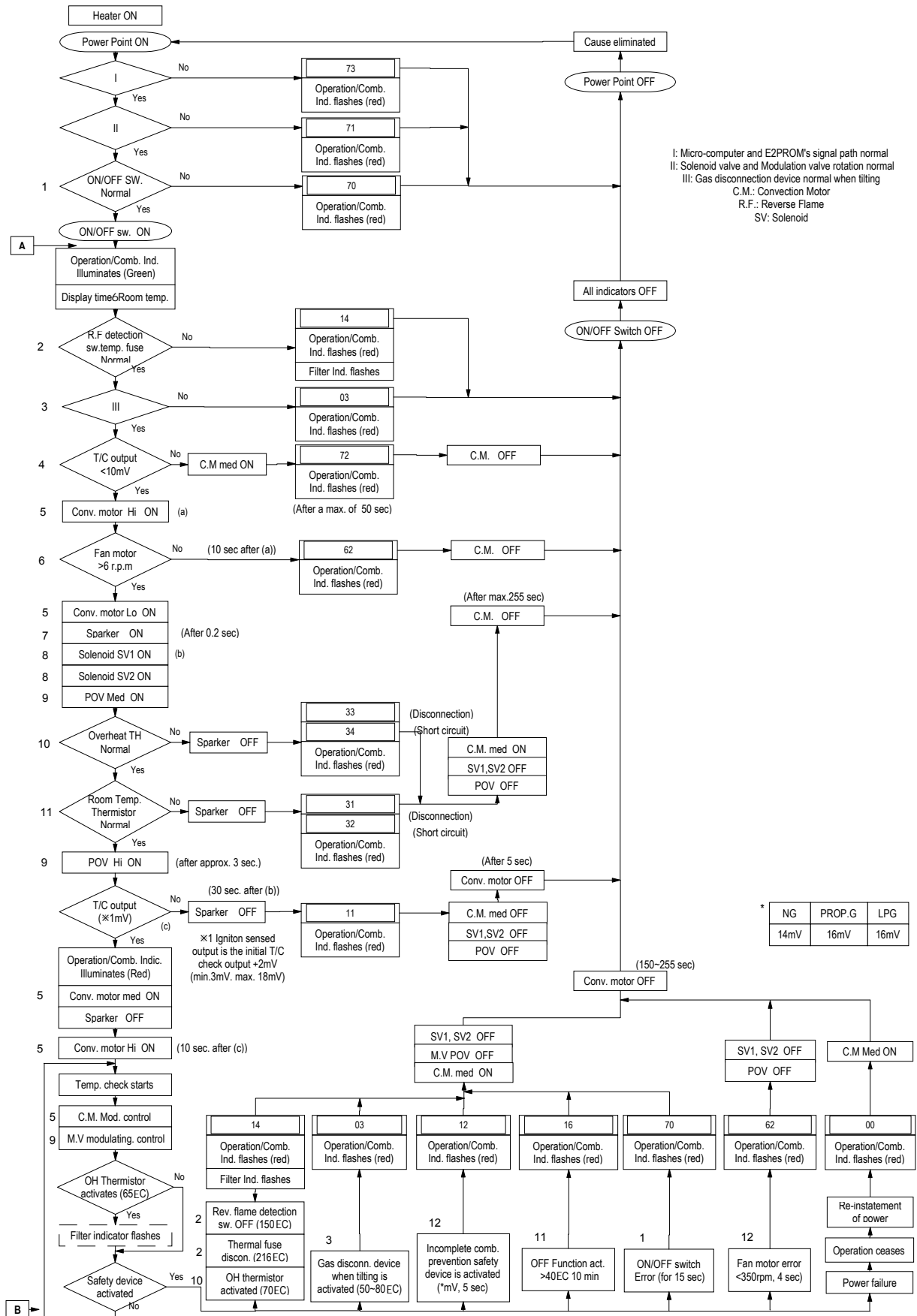


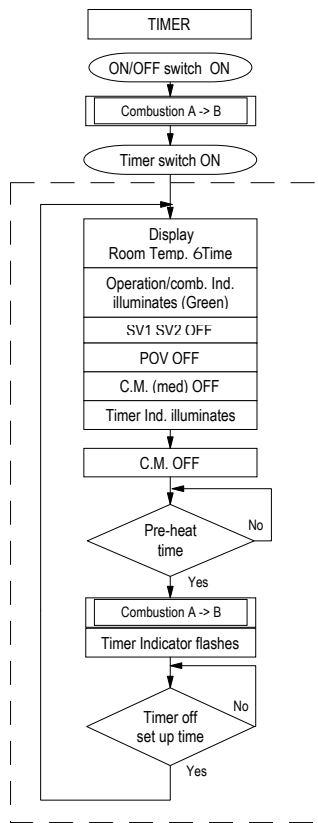
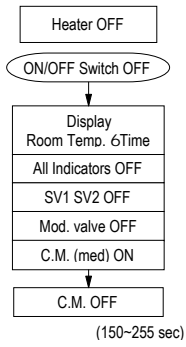
### Combustion Chamber (Combustion Box)

Material	Thickness (mm)	Dimensions
SA1D-40	0.6	As below
Heat Resistant Stainless Steel	0.5	

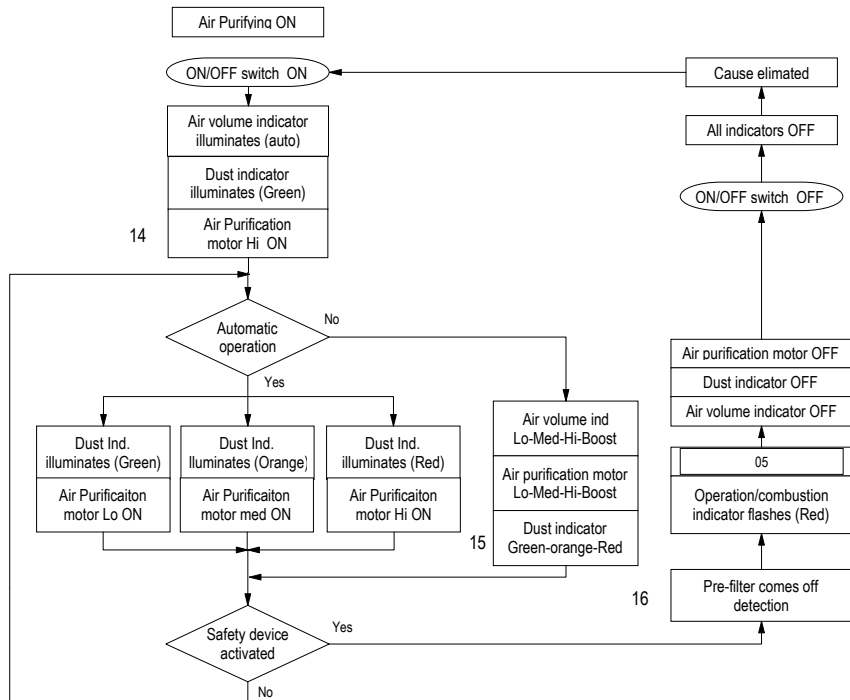
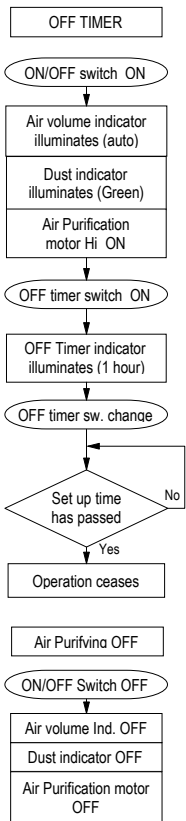


# 10. Operational Flow Chart





\*When Timer 1 or Timer 2 is set up, the heater will operate 1 cycle per day. (Within dotted line)  
 Then Timer 1 and Timer 2 are set up, the heater will operate 2 cycles per day. (Within dotted line)



# 11. Error Code Messages

## Error Code Messages

Error Code	Content	Diagnostic Check Point
00	Power re-instatement while ON/OFF switch ON	-
03	Gas interrupted due to Tilt Switch activation	Check Tilt Switch
05	Detection of Loose Primary Filter	Check Primary Filter
11	Mis-ignition	Check Thermocouple Output
12	Incomplete Combustion Activation Flame Failure	Check Thermocouple Output
14	Overheat Thermistor Activation	Check Overheat Thermistor
14	Reverse Flame Safety Device	Check Reverse Flame Sensor Switch
14	Thermal Fuse Melted	Check Thermal Fuse
16	High Temp. Cut off (10 minutes at > 40° C)	Check Room Temperature Thermistor
31	Room Temperature Thermistor broken circuit	Check Room Temperature Thermistor
32	Room Temperature Thermistor short circuit	Check Room Temperature Thermistor
33	Overheat Thermistor broken circuit	Check Overheat Thermistor
34	Overheat Thermistor short circuit	Check Overheat Thermistor
62	Faulty Fan Motor rpm	Check Convection Fan Motor
70	Heater ON/OFF switch abnormal	Check Control PCB (ON/OFF Switch)
71	Solenoids or modulating valve circuit abnormal	-
72	Thermocouple initial value abnormal	Check Thermocouple output
72	Thermocouple high cut-out (> 48mV for 5 secs)	Check Thermocouple output
73	Communication Error between PCB & E <sup>2</sup> PROM	-

\* If the safety devices activate while either (or both) the heater and air purifier are operating, both will cease operating.

\* When the unit is off, press the “override” and “√” buttons simultaneously for at least 2.5 seconds to display the following at 2.5 second intervals in this order:  
 Error History (No. 1 (most recent) ~ No. 5);  
 Estimated Combustion Time (x100H);  
 Combustion Frequency (x100 times);  
 Estimated Air Purifier Operation Time (x100H); and  
 Actual Air Purifier Operation Time (x100H).

\* When the unit is off, press the “override” and “∧” and “√” buttons simultaneously for 2.5 seconds to reset Error History and Actual Air Purifier Operation Time.



## Memory Function for Maintenance Data

The 5 most recent error messages and the estimated time of combustion, combustion frequency, estimated time of air purifier operation, and air purifier operation time are stored, as well as E<sup>2</sup> PROM.

<How to recall data>

While the unit is off, press the “override” and “√” buttons simultaneously for at least 2.5 seconds to bring up the error history on the display. The error history will display the following in a 2.5 second cycle : the 5 most recent error messages (the most recent is No. 1; No.5 the oldest), estimated time of combustion, combustion frequency, estimated time of air purifier operation, and air purifier operation time.

Example.

Item	Digital Display	Comments
Error History	1 : 12	No. 1 (Latest Error) Sudden Extinction
	2 : 00	No. 2 Power Failure
	3 : 11	No. 3 Mis-ignition
	4 : 11	No. 4 Mis-ignition
	5 : --	No. 5 No error
Combustion Time	40 : 13	1300 hours Not displayed if below 100 hours
Combustion Frequency	10 : 37	3700 times Not displayed if below 100 times
Estimated Air Purifier Operation Time	80 : 50	5000 hours Not displayed if below 100 hours
Air Purifier Operation Time Note 1	F0 : 50	5000 hours Not displayed if below 100 hours

<How to Reset> (Same as Initialisation of E<sup>2</sup> PROM)

- While the unit is OFF, press all three buttons “^”, “√”, and “override” simultaneously for at least 2.5 seconds.
- The digital display will go out, and “88:88” will be displayed when resetting has been completed, then “--:--” will be displayed.

(Additional combustion time, combustion rpm, and additional air purifier operation time will not be reset.)

Note 1: This operation time will be displayed as the actual operation time after initialisation when the reset button is pressed.

## E<sup>2</sup> PROM Data

E<sup>2</sup> PROM data will not be erased during a power failure. However, this data is divided into 2 groups where one of the groups of data can be reset at the external control pads.

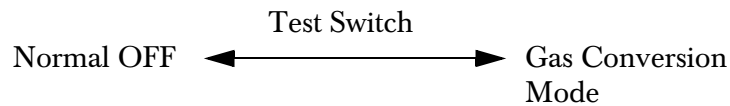
[Permanent Data]	[Deletable Data]	(Initial Setting)
• Modulating Valve Current Supplement Value	• Present Time	( 0:00 AM)
• Fan Current Supplement Value	• Error History	(None)
• Estimated Combustion Time	• Timer 1 Time	( 6:00 AM)
• Combustion Frequency	• Timer 2 Time	( 6:00PM)
• Estimated Air Purifier Operation Time	• Set Room Temperature	( 22° C)
	• Air Purifier Operation Time	( 0 Hours)

### <Resetting>

Refer to “How to Reset” under “Memory Function for Maintenance Data”.

### <Test Mode and Adjustable Mode>

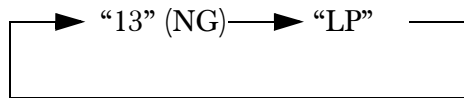
There is a Test Switch on the PCB.



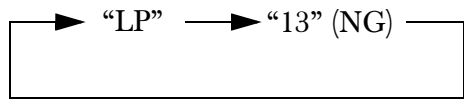
If it is changed over to gas conversion mode while the unit is OFF and with the test button ON, the present gas type code will be displayed.

The gas type code will change with the “^” and “v” temperature buttons.

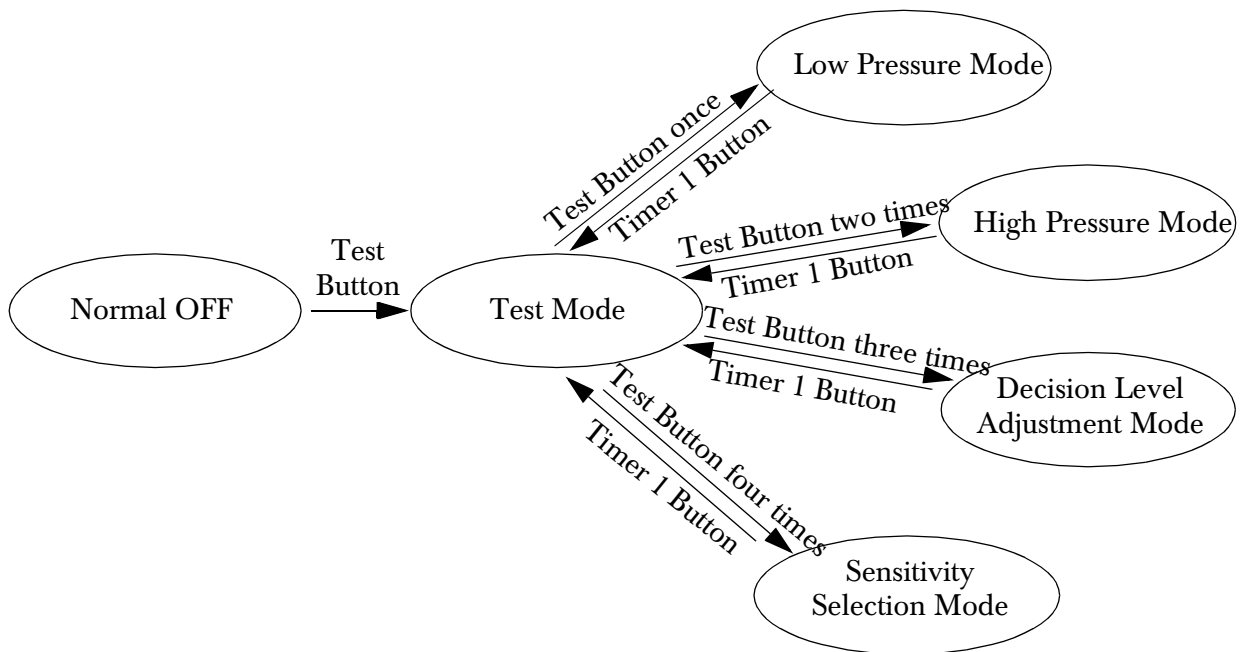
a. When the “v” button is pressed



b. When the “^” button is pressed.



The gas type code will be stored in memory if the test button is pressed again.



The unit will go into Test Mode when the Test Switch is switched ON while the unit is operating. The unit will go into each of the following modes during Test Mode : Low Pressure Mode, High Pressure Mode, Decision Level Adjustment Mode, and Sensitive Selection Mode.

- Test Mode.....Disables the temperature controls and allows you to change the level manually. (Cancels when the test switch is turned on again, or when combustion ceases.) The level can be raised/lowered with the temperature control buttons “^” and “v”, however, if they are continuously pressed for at least 0.5 seconds, it will change to level 12 or level 1.
- Low Pressure Mode.....The modulating valve electric current value for low combustion can be adjusted with the temperature “^” and “v” buttons. After adjusting, the data will be stored when Timer 1 is switched ON.
- High Pressure Mode .....The modulating valve electric current value for high combustion can be adjusted, with the temperature “^” and “v” buttons. After adjusting, the data will be stored when Timer 1 is switched ON.
- Decision Level Adjustment Mode .....The maximum flame failure detection level can be adjusted with the temperature “v” button, and the minimum with the temperature “^” button. They can be set in the following order: 12mV, 14mV, 16mV, 18mV. After adjusting, the data will be stored when Timer 1 is switched ON.
- Sensitivity Selection Mode .....The sensitivity can be changed over from 1 to 2, and vice versa, with the temperature “v” button. After adjusting, the data will be stored when Timer 1 is switched ON. It is factory set at sensitivity level 2.

\* To reset each mode, press the ON/OFF button to turn the unit OFF.

\* If the Timer 1 button is not pressed during each mode, the updated setting will be cancelled and the data will not be stored in memory.

\* If the data is stored, it will return to test mode and the entered information will be displayed.

<LED display during Test/Adjustment Mode>

**1. During Gas Conversion Mode (left side of display)**

Gas Type	NG	LPG
Gas Type Code	13	LP
Displayed	13	LP

**2. During Test Mode**

The first and second digits of the LED display the level.  
 The third and fourth digits of the LED display the entered data.

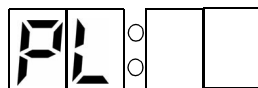
The first and second digits will display:

5 second test delay	Level 1	~	Level 12
		~	

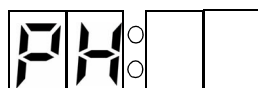
The third and fourth digits will display:

for no entry	for gas type	for low pressure	for high pressure	for standard level

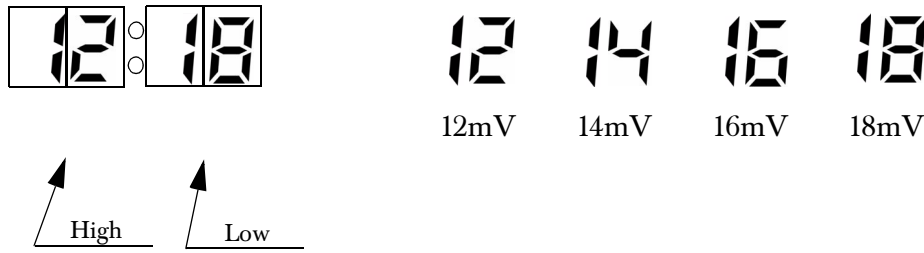
**3. Low Pressure Mode**



**4. High Pressure Mode**



## 5. Standard Level Mode



## Factory Mode

A function called “factory mode”\* has been added to confirm appliance settings.

\*Displays set manufacturing values.

### 1. Operation Method

Press the “^” button continuously, then the “Heat” button.

### 2. Display Contents

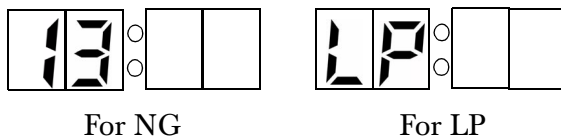
The set values for the Appliance Type Code, Gas Type Code, Flame Failure Detection Level, Dust Sensor Level will be displayed in that order at 2.5 second intervals.

### 3. Display Contents Information

#### a. Appliance Type Code



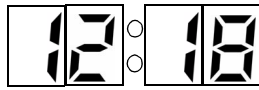
#### b. Gas Type Code



#### c. Flame Failure Detection Level Values



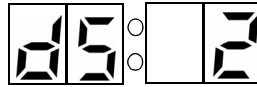
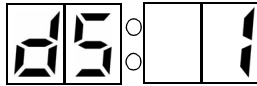
An example of High Flame Failure Detection Level 12mV, and Low Flame Failure Detection Level 18mV



d. Dust Sensor Level

Level 1

Level 2



e. Afterwards, it will revert back to the normal temperature display.

## 12. Diagnostic Points

Flow Chart N <sup>o</sup>	CN	Wire Colour N <sup>o</sup>	Measurement Value	Part
1	B	blue-blue 16 17	switch OFF: 90~100k $\Omega$ ON: 10~30 k $\Omega$	Heater Switch
2	G	white-white 38	<1 $\Omega$	Thermal Fuse
	G <sub>1</sub>	black-white	<DC 1V <1 $\Omega$	Reverse Flame Sensor Switch
3	N	-	DC 4~6 V	Tilt Switch
4	E	black-white	<DC 10mV	Thermocouple
5	J	blue-yellow	Hi~Lo   AC 45~90V	Convection Fan Motor
			150~300 $\Omega$	
6	D	black-white	DC 1~4V	Convection Fan Motor
		GND	>6 rpm (0.4Hz)	
		red-black	DC 4~6V	
7	K	white-white	AC 90 ~ 110V	Sparker
8	K	brown-brown	DC 80~100V	Solenoid Valve
	K <sub>1</sub>	brown brown - yellow yellow	2.0~3.0k $\Omega$	
		K <sub>2</sub>	yellow-yellow	
9	G	red-white	Hi~Lo   DC 0.1~2.0V	Modulating Solenoid Valve
		36-37	16~26 $\Omega$	
10	G <sub>2</sub>	white-white	10° C 115~135k $\Omega$ 20° C 70~85k $\Omega$ 40° C 25~40k $\Omega$	Overheat Thermistor
11	F	yellow-yellow	10° C 58~73k $\Omega$ 20° C 33~44k $\Omega$ 40° C 9~19k $\Omega$	Room Temp. Thermistor
12	E	black-white	(NG) >DC 14mV (LP) >DC 16mV	Thermocouple
13	D	black-white	DC 1~4V	Convection Fan Motor
		GND	>350 rpm (24Hz)	
		red-black	DC 3~8V	
14	H	blue-yellow	AC 45~100V 60~150 $\Omega$	Air Purifier Fan Motor

15	O	black-black	AC 3~7V 31 ~43Ω		Dust Sensor
	P	grey-black	DC 4~6V 1.8~2.2kΩ		
		grey-violet	Dust indicator colour	Voltage	
			green-orange	DC 0.8~2.2V	
orange-red	DC 1.1~2.5V				
16	C	white-white	<1Ω (ON)		Micro-Switch

## Transformer Terminal Voltages/Coil Resistances

Wire Colour No.	Measurement Value
grey - grey	AC 207~264V 33~45Ω
white - white	AC 90~110V 8~20Ω
blue - blue	AC 8~12V 1~4Ω
brown - brown	AC 8~12V 1~4Ω
violet - violet	AC 10~15V 0.5~2Ω
black - black	AC 3~7V 0.5~2Ω

## Convection Fan (rpm) (± 100)

	Gas Type	High	Low
460PTR	NG	800	550
	LPG	870	480
560PTR	NG	840	550
	LPG	950	480



# 13. Fault Finding Procedure

## Initial Checks

Service Call System	Check Points (No.'s refer to causes outlined in the following pages)
Appliance does not operate after having pressed ON/OFF switch. (ON/Combustion indicator does not illuminate green.)	<ul style="list-style-type: none"> <li>• Check electrical cord is connected to the power point.</li> <li>• Confirm power supply.</li> <li>• Check Function Lock (Indicator).</li> </ul>
Ignition does not occur. (ON/Combustion Indicator does not illuminate red.) (Error code "11")	<ul style="list-style-type: none"> <li>• Check gas hose is plugged in..... 1</li> <li>• Check gas type matches that supplied to appliance.</li> <li>• Check gas hose isn't bent/crimped..... 1</li> <li>• Air in gas supply. .... 1</li> </ul>
No sparker noise even when Heater ON/OFF button is pressed	<ul style="list-style-type: none"> <li>• This appliance uses a muted sparker and makes a different sound to older units.</li> </ul>
Auto-economy indicator does not illuminate.	<ul style="list-style-type: none"> <li>• This appliance has an auto-economy function which automatically starts operating ("Economy" indicator illuminates) 30 minutes after a room reaches the set temperature. However, the auto-economy function will not operate if the temperature is set to L, 16, 26, or H.</li> </ul>
Room does not warm up.	<ul style="list-style-type: none"> <li>• Check preset temperature.....2</li> <li>• Blocked air filter .....3</li> <li>• Warm air outlet short circuit (obstruction).....4</li> <li>• Inadequate gas supply..... 1</li> </ul>
Flame Failure. Error Code "12" Error Code "14" Error Code "00"*  *When power is restored after power failure.	<ul style="list-style-type: none"> <li>• Insufficient ventilation.....5</li> <li>• Blocked air filter .....3</li> <li>• Power failure.</li> <li>• Warm air outlet short circuit (obstruction).....4</li> <li>• Check gas type</li> <li>• Strong wind against appliance.</li> <li>• Inadequate gas supply (pipe bent/crimped) ..... 1</li> <li>• Reverse flame.....7</li> </ul>
There is a smell of gas.	<ul style="list-style-type: none"> <li>• Leaking gas supply (faulty connection) ..... 1</li> <li>• Safety device operating.</li> <li>• Smell of combustion by-product.....6</li> </ul>
Air Purifier does not operate when "Purif ON/OFF" button is pressed.	<ul style="list-style-type: none"> <li>• Check electrical cord is connected to the power point.</li> <li>• Confirm power supply.</li> <li>• Loose primary filter. (Error code 05).....8</li> </ul>
Dust sensor does not illuminate red even if cigarette smoke is present.	<ul style="list-style-type: none"> <li>• Installation location (size of room)</li> <li>• Straight after power cord is connected.</li> <li>Y The dust indicator will illuminate green while the dust sensor is stabilising (for approx. 1 min. after power re-instatement of for approx 20 sec. after air purifier commences operation).</li> <li>• Dust sensor lens is dirty..... 9</li> </ul>
Dust sensor indicator stays red.	<ul style="list-style-type: none"> <li>• Air in room is not clean.</li> </ul>
Smoke and odours become hard to remove from room. Heater becomes noisy.	<ul style="list-style-type: none"> <li>• Filter is not clean (Clean the filter. If there is no change, replace with new filter.) ..... 10</li> </ul>

1. Gas Supply
  - <Ignition does not occur> <Room does not warm up> <Smell of gas>
    - Is the gas supply fully open?
    - Is the gas hose bent?
    - Is the gas supply squashed?
    - Is the gas hose too long?
    - Is the gas supply connected correctly?
  - Y Ensure the gas supply is fully open.
  - Y Ignition problems can be caused by poor gas supply, or air in the supply line. (There may be a gaseous odour until ignition.)
  
2. Preset Temperature
  - <Room does not warm up>
    - Is the set temperature lower than the current room temperature? (Appliance switches to “Low” approx. 1 minute after ignition)
  - Y Set the room temperature higher than the present room temperature.
  - Y Adjust to the desired room temperature with the room temperature control buttons.
  
3. Air Filter Blockage
  - <Room does not warm up> <Extinguishes suddenly>
    - Is the air filter blocked by dust or is a curtain touching it?
    - Has the safety device been activated by the dust blockage? (Error Code 14)
  - Y Clean the filter at least once a month.
  
4. Warm Air Short Circuit (Obstructions)
  - <Room does not warm up> <Extinguishes suddenly>
    - Are there any obstructions in front of the warm air outlet? (Error Code 14)
  - Y Do not cover or place any obstructing objects within 1 m of the warm air outlet.
  
5. Insufficient Ventilation
  - <Extinguishes suddenly>
    - Is the room sufficiently ventilated? (Error Code 12)
  - Y During use, ventilate the room every hour by turning on a fan for 1 minute or by opening a window.
  
6. Exhaust Smell From Appliance
  - <There is a gaseous smell>
    - This appliance emits exhaust by-products into the room. When igniting/extinguishing, there may be a slight smell.
  
7. Reverse Flame
  - <Extinguishes suddenly>
    - Is the air filter blocked by dust or is a curtain touching it?
    - Is there any blockage in the burner or restrictor?
    - Is combustion, gas pressure etc. normal? (Error Code 14)
  
8. Loose Primary Filter
  - <Air Purifier does not operate>
    - If the primary filter is incorrectly installed, the micro-switch will not activate and the air purifier will not operate. (Error Code 05)
  
9. Unclean Dust Sensor Lens
  - <Dust Indicator will not illuminate red>
    - The sensitivity of the dust sensor decreases when the lens becomes dirty. Clean the lens as stated in the customer instruction manual and place the sticker on the right side of the unit.

## 10. Unclean Filter Cartridge

<Smoke and odours are not removed> <Heater becomes noisy>

- The replacement period for the filter cartridge will vary due to use and location of installation, however, it should be replaced yearly.

## Conditions that are not faults

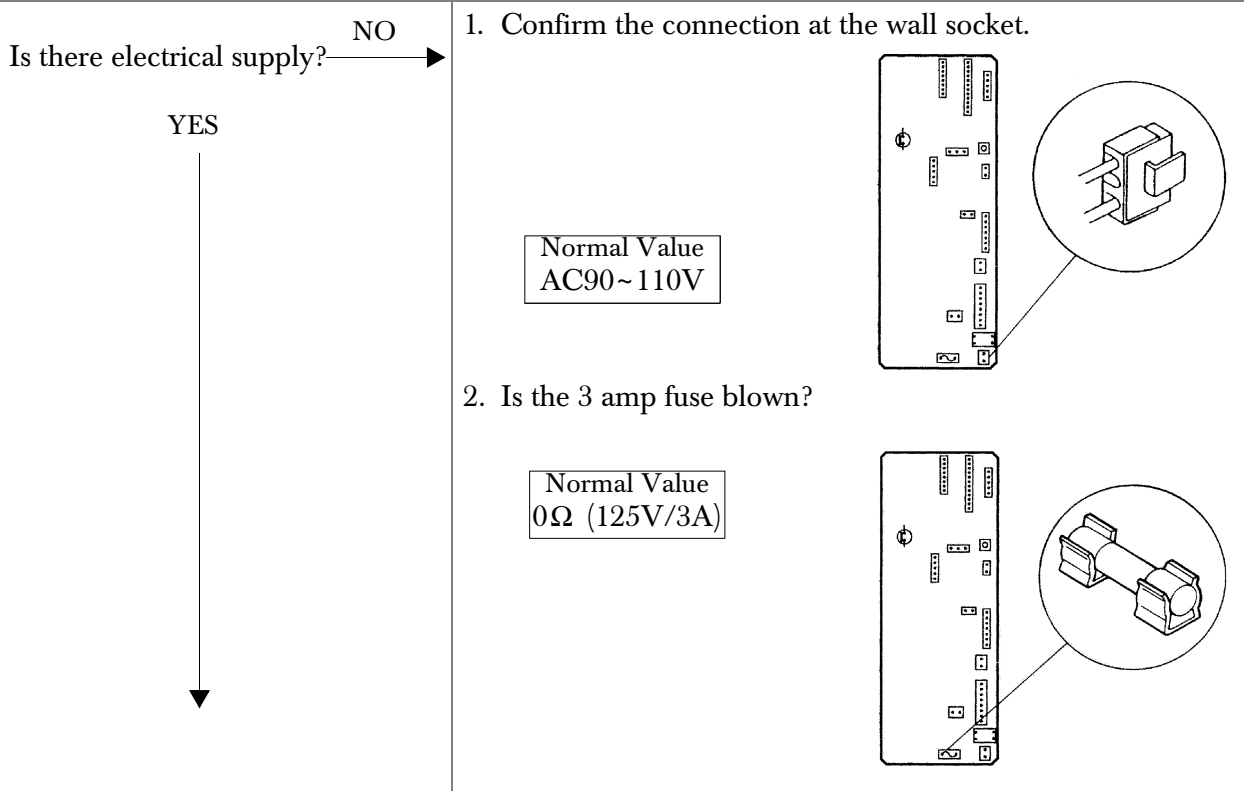
Condition	Cause and Explanation
Ignition is slow and cold air is blown from appliance	When the ON/OFF switch is pressed, ignition occurs, however, ignition could be delayed due to air in the gas supply line. Combustion Indicator (red) will not illuminate until the thermocouple has heated up. There will be a delay of a few seconds after ignition.
Warm air continues to blow even after switching appliance OFF	The fan stops after releasing all residual heat from within the appliance. (approx. 255 secs if filter indicator flashes)
Clicking sound when the burner ignites.	Normal ignition sound. The extent of the sound will depend on gas pressure and burner temperature. (Sound is of re-ignition straight after extinction.)
Resonant sound after ignition.	Movement of the flame as it travels across the burner. This will soon go.
After ignition/extinction there is a ticking or clicking noise.	This is the sound of the combustion chamber metal expanding/contracting due to heat, and is normal.
The heater does not ignite upon initial use.	There may be air in the gas supply, preventing the appliance igniting immediately. If ignition does not occur after 30 seconds, the spark will stop and the heater will lockout. Turn the heater off to reset before attempting ignition again.
There is smoke or an unusual smell upon initial use	There may be grease or a smell of smoke when first using the appliance. This will stop after a short period. Increase the ventilation when using the appliance.
Slight odour upon burner ignition/extinction.	There may be a slight odour upon ignition/extinction of burner. (This will go once flame becomes stable.)

# 14. Fault Analysis



**Note:** Before carrying out resistance checks, disconnect power.

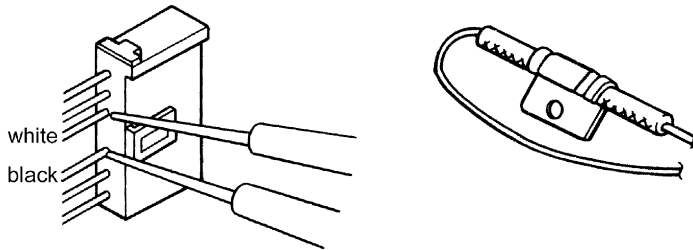
- A: After pressing the Heater ON/OFF button:**
- the convection fan does not begin to rotate.
  - the solenoid valves do not open.
  - there is no spark.



**a. The sequence does not continue.**

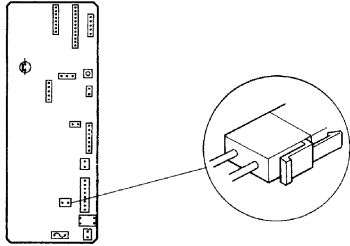
- Broken wiring or loose pin connectors. (Open circuit)
- Faulty control panel PCB (Heater ON/OFF button).
- Faulty PCB.
- Thermal fuse has melted (Error Code “14”).

Normal Value 0Ω  
(Melts at 216°C)



**b. The convection fan does not begin to rotate.**

1. Convection fan shaft grub screw loose.
2. An obstruction in the convection fan is preventing the fan from rotating.
3. Open circuit or bad connection in motor circuit. (Error code "62")

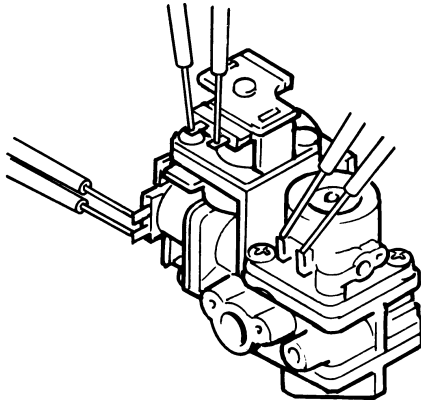


Motor Coil	Normal Value
	150~300Ω

4. Faulty PCB.

**c. The solenoid valves do not open**

1. Broken wiring or loose pin connectors.
2. Solenoid coil wiring is broken or shorted.



SV <sub>1</sub>	Normal Value:
SV <sub>2</sub>	2.0~3.0kΩ
Modulating Valve	Normal Value
	16~26Ω

3. Faulty PCB. (No DC90V circuit to solenoid.)

**d. There is no spark**

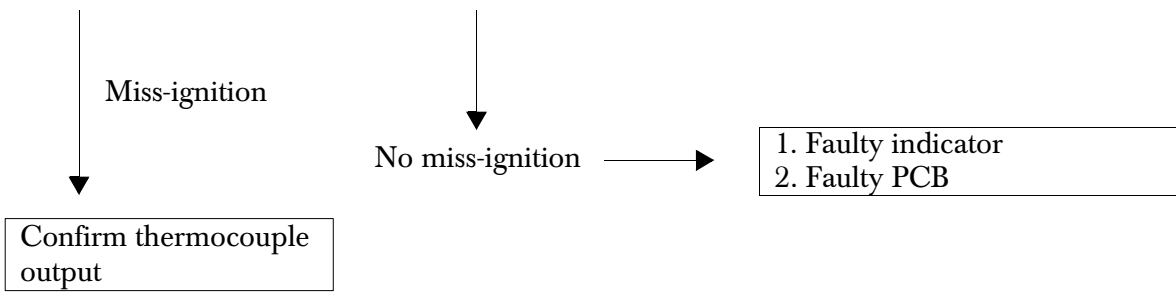
1. High tension cord disconnected or broken.
2. Leak due to broken electrode etc.
3. Incorrect spark gap (Normal spark electrode gap is 2.2 ~ 3.0 mm).
4. Faulty PCB.

**B:After repeated efforts to operate the appliance, it will not ignite. (Error code "11")  
(No warm air)**

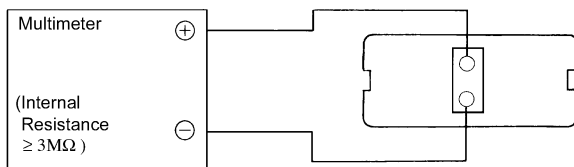
1. Air is in the gas supply.
2. Incorrect gas pressure (primary).
3. Incorrect gas type, or kink in the gas supply hose, or the hose is too long.
4. Faulty sparker.
5. Blocked injector.
6. Incorrect combustion specification. (Injector, restrictor, regulator pressure etc).

**C: There is warm air, however the combustion indicator does not illuminate.**

30 seconds after ignition, the spark stops and miss-ignition occurs.

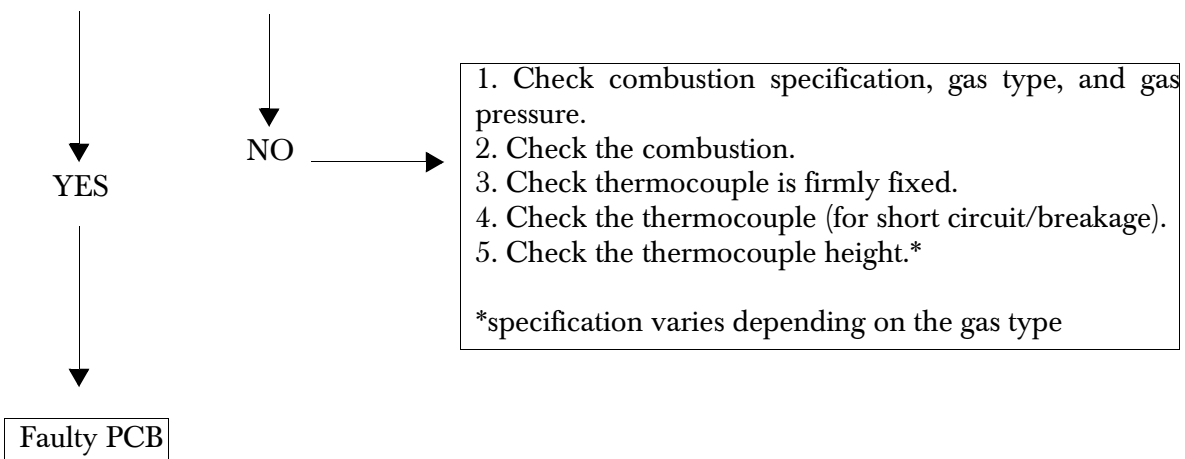


**Thermocouple Output Checking Method**  
 (Connect the multimeter to the output checking terminal at the back of the appliance).



Output Checking Terminal (Lower S, Upper ⊕)

Is the output NG:14mV LP:16mV DC or above?



## D: The flame fails during normal operation

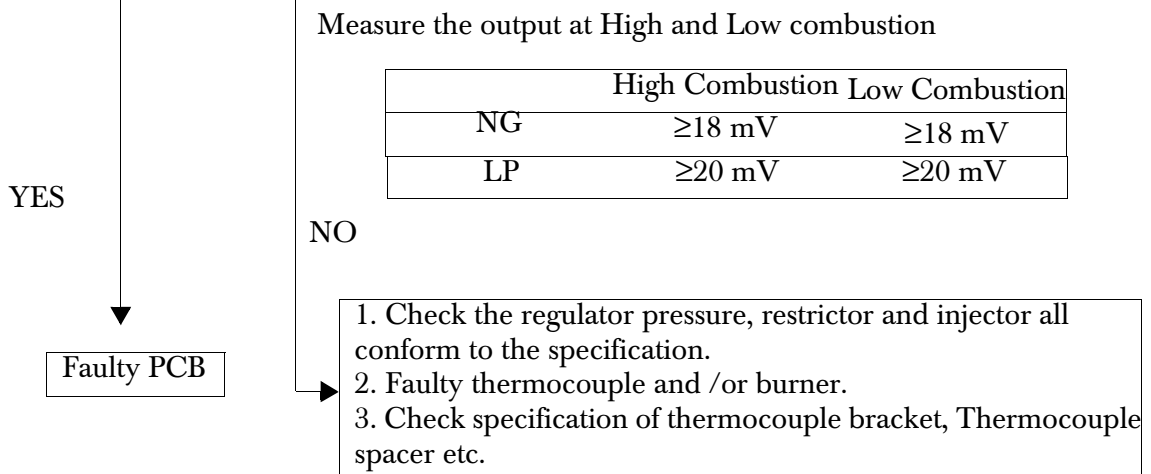
1. Power failure. All indicators turned off. Heater ON/OFF Switch ON after power reinstatement.
2. Heater has been tilted. Tilt switch has activated. (Error code "03").
3. A safety device has activated.
  - Air filter is blocked and OHS is activated. (Error code "14")
  - Incomplete Combustion Prevention Device (ODS) is activated due to insufficient ventilation.
  - Kink/block in the gas supply hose. Hose too long. (Error code "12")
  - Gas pressure is abnormally low.
  - There is a breeze against the unit.
  - Clearances around the appliance are insufficient.
  - Obstructions in front of the heater. (Refer to Installation Instructions).
4. Safety devices are activated Check wiring is not broken or pin connectors loose.

Flame failure occurs between 30 minutes to 1 hour after ignition. (Error code "12")

Incomplete combustion prevention device (ODS) possibly early cut-off.

Check thermocouple output.

Confirm thermocouple output (mV) is stable and as shown in the table below.

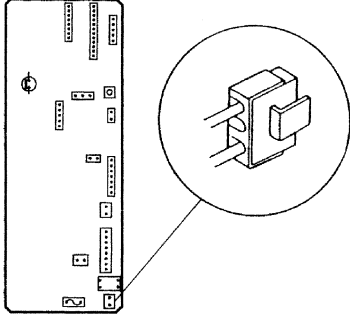
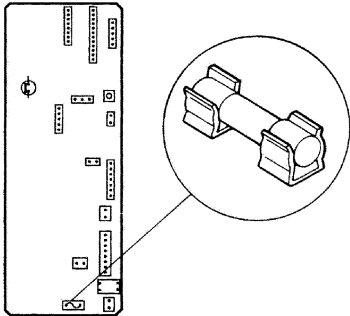


Faulty PCB

Reverse Flame (With large noise) and flame fails. Error code "14"

1. Blocked air filter.
2. Blocked burner or restrictor.
3. Dust or foreign matter in the combustion chamber.
4. Incorrect combustion specification or pressure setting.

**E:After pressing the Air Purifier ON/OFF button:  
a. the air purifier fan does not begin to rotate.**

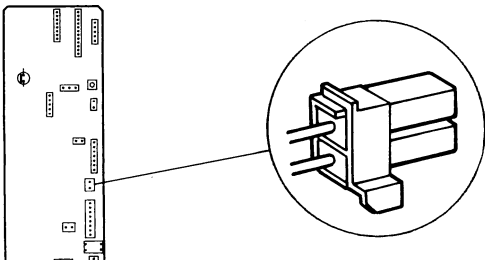
<p>Is there electrical supply? →</p> <p style="text-align: center;">NO</p> <p style="text-align: center;">YES</p>	<p>1. Confirm the connection at the wall socket.</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">Normal Value AC90~110V</div>  </div> <p>2. Is the 3 amp fuse blown?</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">Normal Value 0Ω (125V.3A)</div>  </div>
---	---

**a. The sequence does not continue.**

1. Broken wiring or loose pin connectors. (Open circuit)
2. Faulty control panel PCB. (Air Purifier ON/OFF button)
3. Faulty PCB.
4. Loose primary filter. (Error code "05")

**b. The air purifier fan does not begin to rotate.**

1. Air purifier fan shaft grub screw loose.
2. An obstruction in the air purifier fan is preventing the fan from rotating.
3. Open circuit or bad connection in motor circuit.



Motor Coil Normal Value  
60~150Ω

4. Faulty PCB.



### Confirming simple operation of dust sensor

Necessary equipment

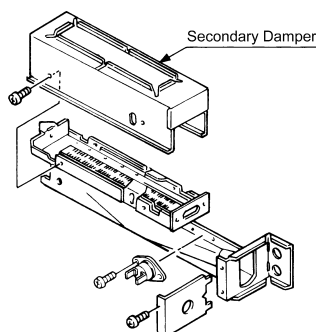
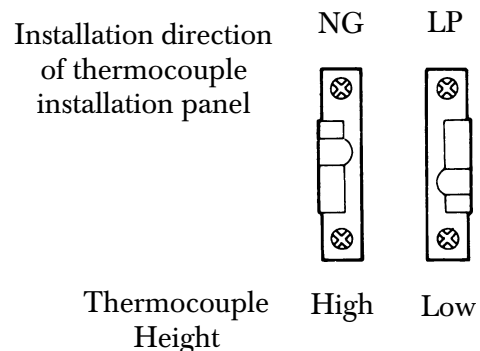
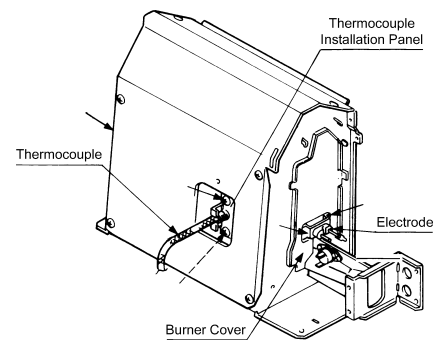
Infra-red TV remote control

1. Remove the dust sensor cover on the right hand side of the appliance. (The dust sensor is inside the triangular opening.)
2. Press the air purifier button to turn it ON. The dust indicator will illuminate green.  
\* If the power cord has just been plugged in, carry out this step after one minute has passed.
3. After at least 20 seconds has passed, face the remote control in the direction of the triangular opening, and press the volume buttons continuously for 10~20 seconds.
4. Within 20 seconds the dust indicator will change from green, to orange, to red.

# 15. Gas Conversion



1. Remove the front panel (see “Removal of the Front Panel Assembly” on page 48).
2. Remove the filter (see “Removal of the Purifier Filter” on page 48).
3. Replace small gas label on gas inlet, and large gas label on back of appliance.
4. Place new very small gas label on Data Plate.
5. Complete details on conversion sticker, place sticker inside front panel.
6. Remove convection fan and combustion chamber assemblies (see “Removal of the Convection Fan Assy on page 52) to gain access to the burner.
7. Remove the burner assembly (see “Removal of the Spark Electrode” on page 53) and replace.
8. Remove the overheat switch from the burner and replace (2 screws).
9. Remove the secondary aeration cover (6 screws).
10. Remove the electrode (2 screws) and burner blanking plate and fit to the new burner.
11. Fit restrictor to new burner assembly.
12. Refit the new burner to the combustion chamber.
13. Refit Thermocouple with spacer (A & B) fold on bracket facing to the right (see diagram below).
14. Replace the blanking plate, electrode assembly, overheat switch, thermocouple assembly, combustion chamber hood cover, gas supply connection, and connection tube clips.
15. Slide combustion chamber back and screw into place.
16. Replace and refit injector and filter.
17. Reconnect gas and electrical supplies.
18. Carry out gas pressure setting procedure on page 46.
19. Replace the front panel.



## 16. Gas Pressure Setting Procedure

---



### 1. Gas Type Changeover

- When the unit is off, press the test switch at the top of the PCB for at least 0.3 seconds; The unit will go into gas type changeover mode. The present gas type code will be shown on the left side of the display (NG(13), LP(LP), or Towns Gas(6C)).
- Choose the gas type code with the “^”(Up) and “v” (Down) buttons.
- The gas type code will be stored in memory when the test switch is pressed again. The display will go out and will return to its normal off state.

### 2. Modulating Valve G Adjustment, Entering Detection Level

- Press Heat ON/OFF button to operate heater.
- Press test switch at top of PCB twice; The unit will go into low pressure test mode. “PL” will be shown on the left side of the display.
- Adjust low combustion secondary pressure with the “^” (increase gas volume) and “v” (decrease gas volume) buttons.
- Press the ON Timer button. When the left side of the display changes to “01”, the low pressure test data will be stored in memory.
- Next, press the test switch twice; The unit will go into high pressure test mode. “PH” will be shown on the left side of the display.
- Adjust high combustion secondary pressure with the “^” and “v” buttons.
- Press the ON Timer button. When the left side of the display changes to “12”, the high combustion test data will be stored in memory.  
(If the test switch and the ON/OFF button are pressed instead of the ON Timer button in steps 4~7, the test pressures will be cancelled.)
- Press the test switch 3 times. The unit will go into detection level adjustment mode. Numbers will be shown on the display.
- Adjust the low detection level with the “^” button and the high with the “v” button. The two digits on the left of the display will show the high value, and the two digits on the right of the display will show low. The display will show “12” Y “14” Y “16” Y “18”.
- Press the ON Timer button. When the left of the display changes to “12”, the detection level will be stored in memory.
- Press the Heat ON/OFF button to turn the heater off.  
(If the heater is not turned off, it will not return to its normal state.)

# 17. Dismantling for Servicing

---



**NOTE:** Before proceeding with dismantling, be sure to follow the CAUTION instructions before each explanation.

- e.g.    - Isolate gas supply  
          - Disconnect electrical supply from wall socket

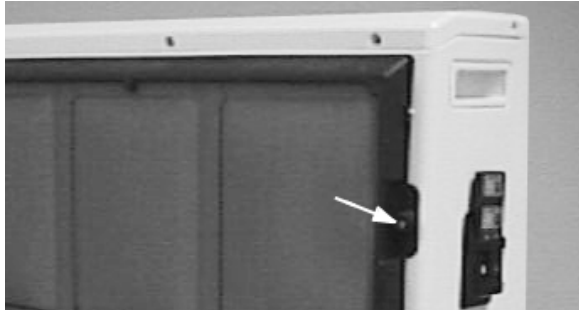
ITEM	PAGE
1. Removal of the Purifier Filter .....	48
2. Removal of the Control Panel Assy.....	48
3. Removal of the Front Panel .....	48
4. Removal of the Purifier Fan Assembly .....	48
5. Removal of the Transformer .....	49
6. Removal of the Dust Sensor.....	49
7. Removal of the Surge Protector and Sparker Unit.....	50
8. Removal of the Overheat Switch.....	50
9. Removal of the Thermocouple .....	50
10. Removal of the PCB.....	51
11. Removal of the Gas Control Assembly .....	51
12. Removal of the Heater Filter.....	51
13. Removal of the Convection Fan Assy .....	52
14. Removal of the Combustion Chamber .....	52
15. Removal of the Spark Electrode .....	53
16. Removal of the Main Burner.....	53
17. Removal of the Thermistor .....	54
18. Removal of the Injector .....	54

*Unless otherwise stated, re-assembly is the reverse of dismantling.*

## 1. Removal of the Purifier Filter

### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**



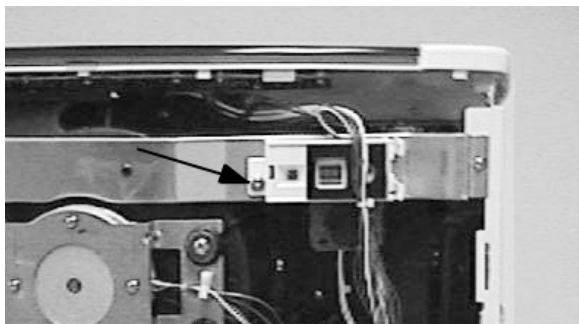
- a. Remove the thumb screw (1 screw).
- b. Remove the Primary Filter, then the Purifier Filter.

## 2. Removal of the Control Panel Assy

### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Remove 5 screws (1 on each side, 3 at the back.).
- b. Lift from the back first, then disengage from the catches on the front panel.
- c. Remove the Front Panel (refer to section 3 - Removal of Front Panel).
- d. Remove the screw from the indicator and disengage the two (2) clips from the securing bracket.



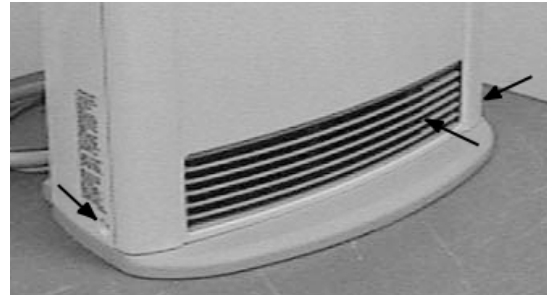
- e. Disconnect 3 (three) wiring loom connectors from PCB.

## 3. Removal of the Front Panel

### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Remove three (3) bottom screws (1 on each side, 1 at front).



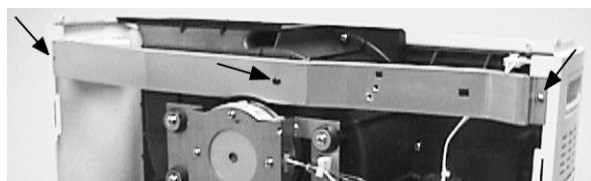
- b. Follow sections 2. a. and b.
- c. Lift the front panel slightly, and pull towards you.

## 4. Removal of the Purifier Fan Assembly

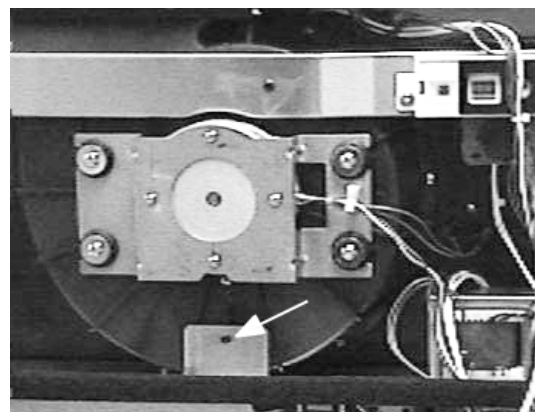
### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

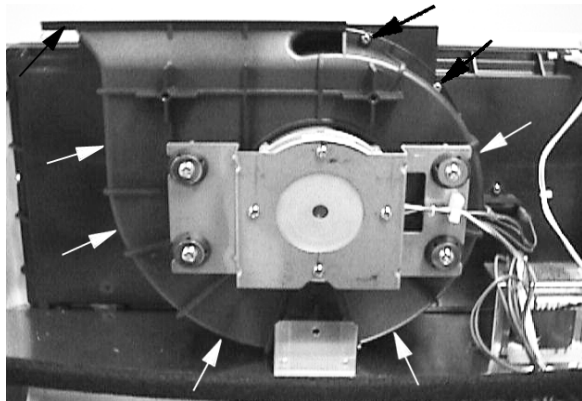
- a. Follow section 3 (Removal of the Front Panel).
- b. Remove the top securing bracket (3 screws).



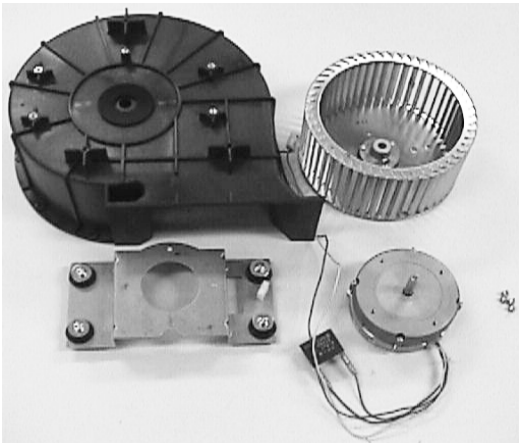
- c. Remove one (1) screw from the bottom securing bracket.



- d. Remove the eight (8) screws securing the fan housing to the back panel.



- e. Remove the capacitor to the right of the fan housing (1 screw) and wiring loom from the main PCB.
- f. Further disassembly would be required to replace motor as shown below.

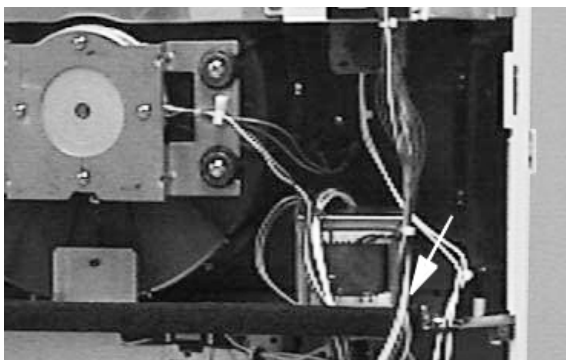


### 5. Removal of the Transformer

#### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Remove one (1) screw from the right hand bracket.



- c. Disconnect 3 connectors (main PCB, surge protector and dust sensor. Follow section 6 to remove dust sensor.)

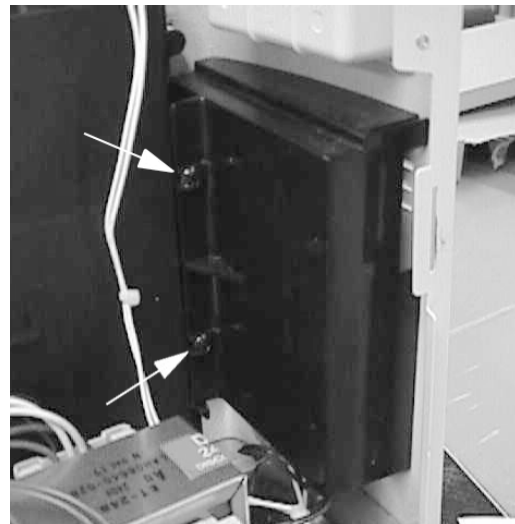
- d. Disengage transformer.

### 6. Removal of the Dust Sensor

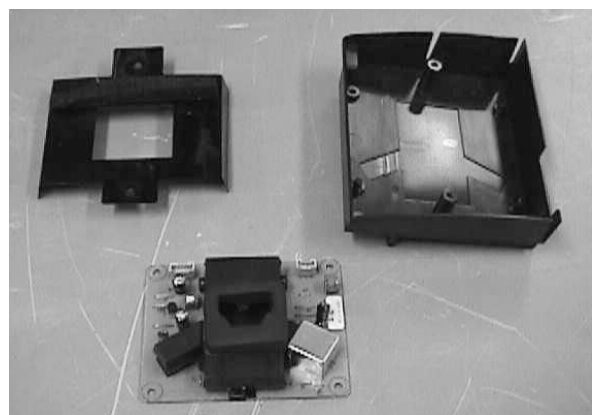
#### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Remove two (2) screws.



- c. Remove protective plastic cover. (2 screws)
- d. Remove two (2) connectors.
- e. Further disassembly would be required to replace the dust sensor as shown below

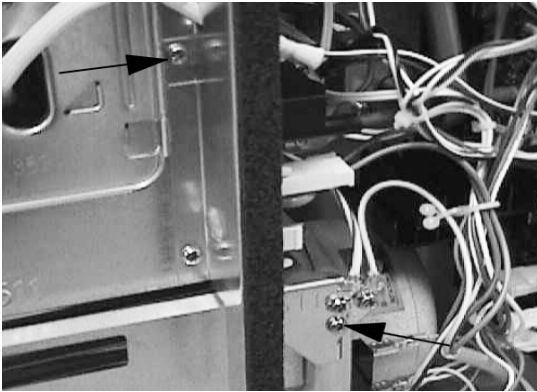


## 7. Removal of the Surge Protector and Sparker Unit

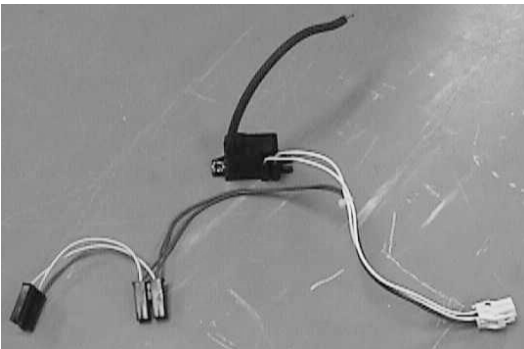
### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Remove two (2) screws from the surge protector sparker unit bracket.



- c. Lift from bracket
- d. Disconnect all leads.
- e. Disconnect sparker unit from PCB and solenoid loom. (Note: the sparker unit comes complete with wiring loom for solenoids as shown below.)



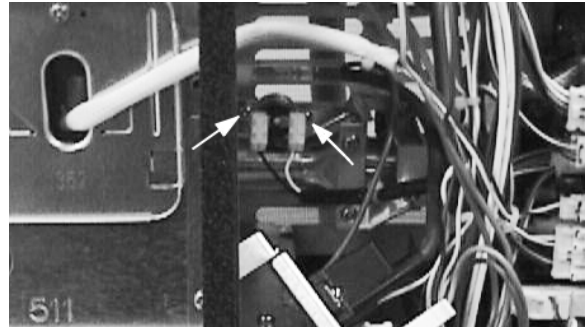
## 8. Removal of the Overheat Switch

### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Remove surge protector/sparker assy (Follow section 7 b and 7 c).

- c. Remove the two (2) screws from the OHS.

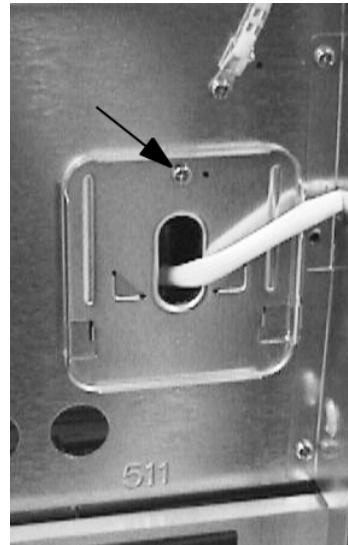


## 9. Removal of the Thermocouple

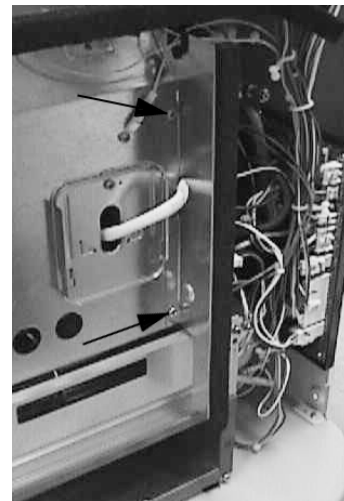
### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

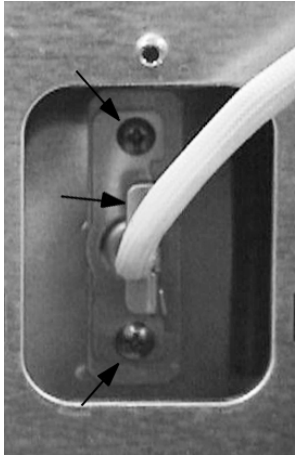
- a. Follow section 3 (Removal of the Front Panel).
- b. Remove one (1) screw securing the cover plate



- c. Lift and remove bracket (2 screws).



- d. Disconnect connector from PCB.
- e. Remove the two (2) screws securing the bracket and disengage from burner assy (top and bottom).



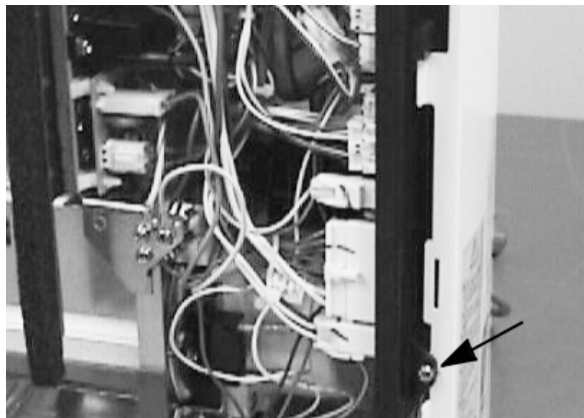
- f. Remove one (1) screw to release the thermocouple from the bracket (side).

### 10. Removal of the PCB

**CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Remove one (1) screw, lift and pull forward. Unclip all connectors.



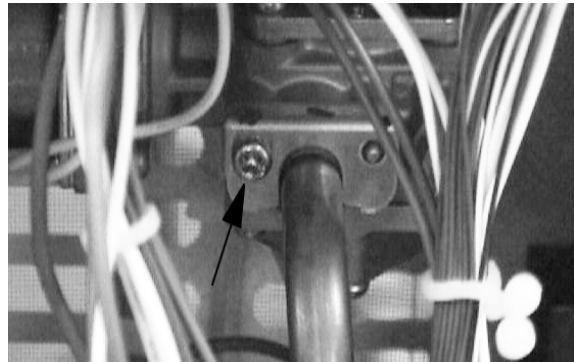
### 11. Removal of the Gas Control Assembly

**CAUTION**

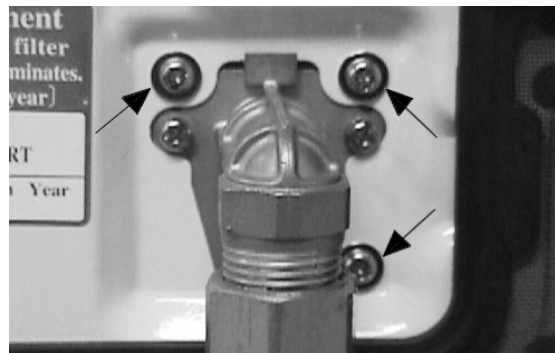
**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).

- b. Disconnect the gas supply hose at the rear of the appliance.
- c. Remove one (1) screw from the front of the gas supply tube upper to remove.  
Note: Don't lose O-rings from gas tube.



- d. Remove two (2) screws from front of the gas supply tube lower.
- e. Remove gas tube.
- f. Remove the gas control securing screws (three (3) from the rear of the appliance).

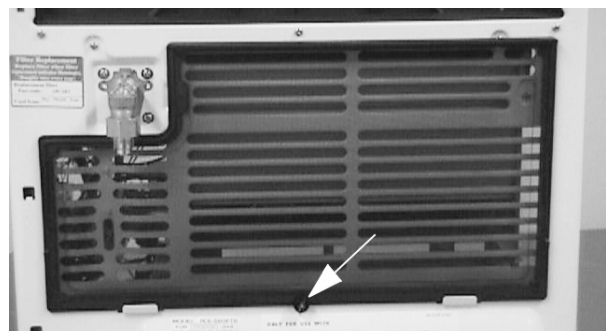


### 12. Removal of the Heater Filter

**CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Remove the bottom screw (large) and pull the filter in an upwards direction to remove.



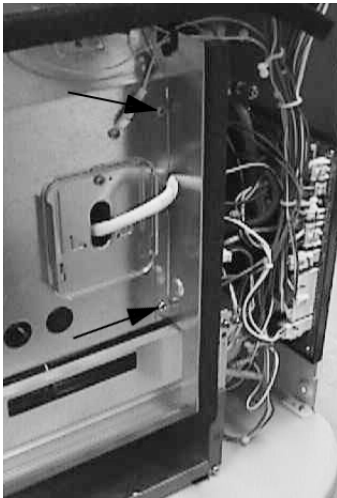


### 13. Removal of the Convection Fan Assy

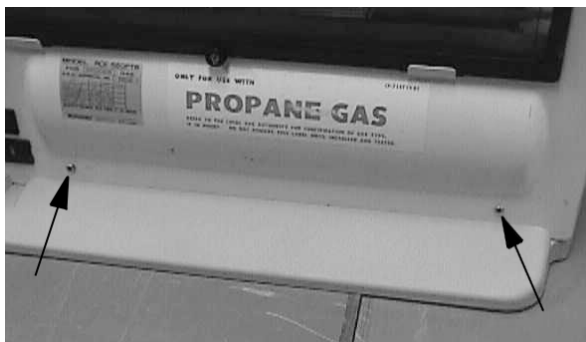
#### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Follow section 7 c (Removal of the Surge Protector and Sparker Unit).
- c. Remove bracket (two (2) screws).



- d. Remove six (6) fan assembly securing screws at the bottom of the appliance, and at the bottom back of the appliance.



- e. Slide fan forward and disconnect wires from PCB.

### 14. Removal of the Combustion Chamber

#### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Remove heater filter (follow section 12).
- c. Remove two (2) screws from the rear of the appliance (middle).

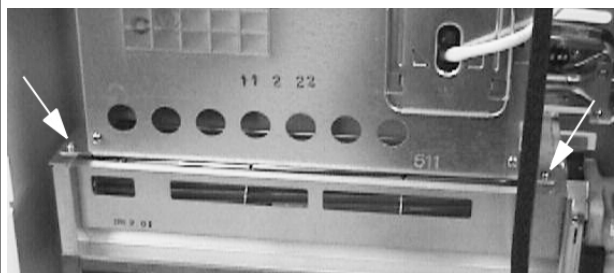


- d. Remove the surge protector and sparker unit (Follow section 7 c).

- e. Remove bracket.



- f. Remove the two (2) securing screws on both sides of the combustion chamber base.



- g. Remove one (1) gas supply tube securing screw, as per section 11 c.

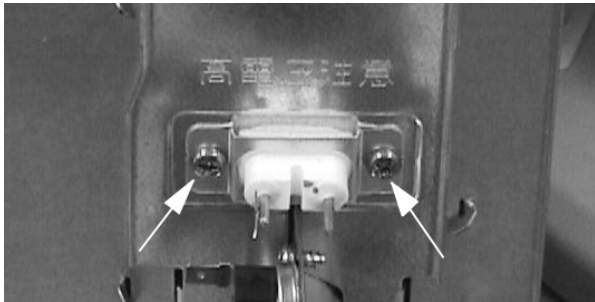
- h. Unclip the connectors in the harness and manoeuvre the combustion chamber out of the appliance completely.

## 15. Removal of the Spark Electrode

### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

- a. Follow section 3 (Removal of the Front Panel).
- b. Follow section 14 (Removal of the Combustion Chamber.)
- c. Remove two (2) screws to remove the electrode bracket.

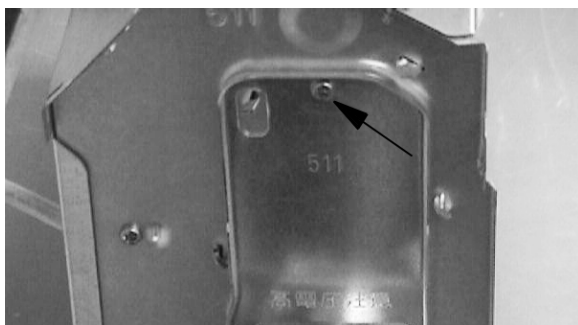


## 16. Removal of the Main Burner

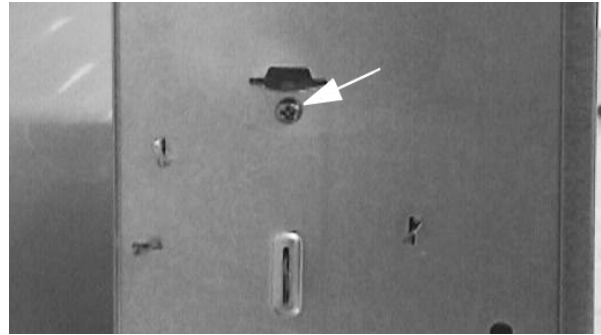
### **CAUTION**

**240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with the neon screwdriver or multimeter.**

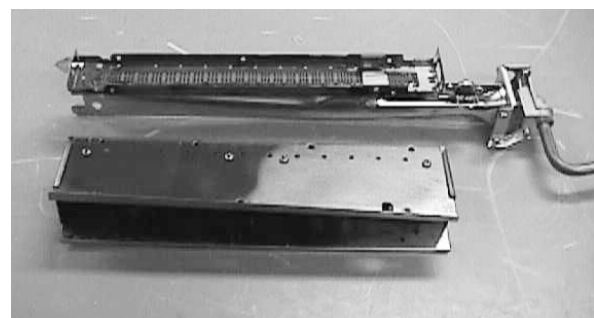
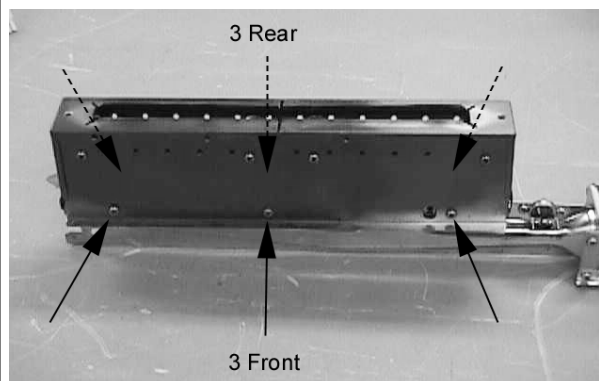
- a. Follow section 3 (Removal of the Front Panel).
- b. Follow section 14 (Removal of the Combustion Chamber.)
- c. Remove the spark electrode (Follow section 15).
- d. Follow section 8 c (Removal of the Overheat Switch).
- e. Remove one (1) screw from the locating bracket (top).



- f. Lift and remove locating bracket.
- g. Remove one (1) screw from the other end of the combustion chamber (middle).
- h. Remove thermocouple assy (follow section 9).



- i. Lift top tab to release the burner and pull out of combustion chamber in the direction of the gas supply tube.
- j. Remove the six (6) screws to remove the burner cover shield.



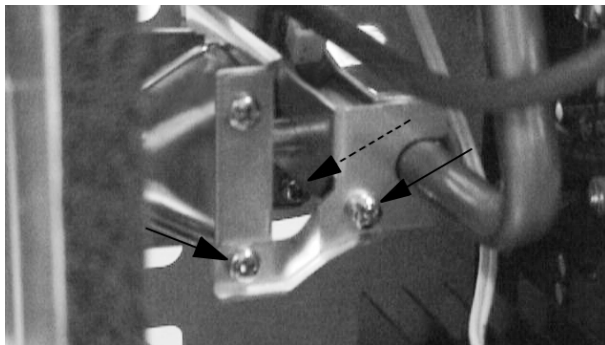
### 17. Removal of the Thermistor

- a. Follow section 3 (Removal of the Front Panel).
- b. Pry open the two (2) locating clips with a screwdriver and disconnect from the PCB.



### 18. Removal of the Injector

- a. Follow section 3 (Removal of the Front Panel).
- b. Remove four (4) screws (2 from bracket, 2 from injector block).

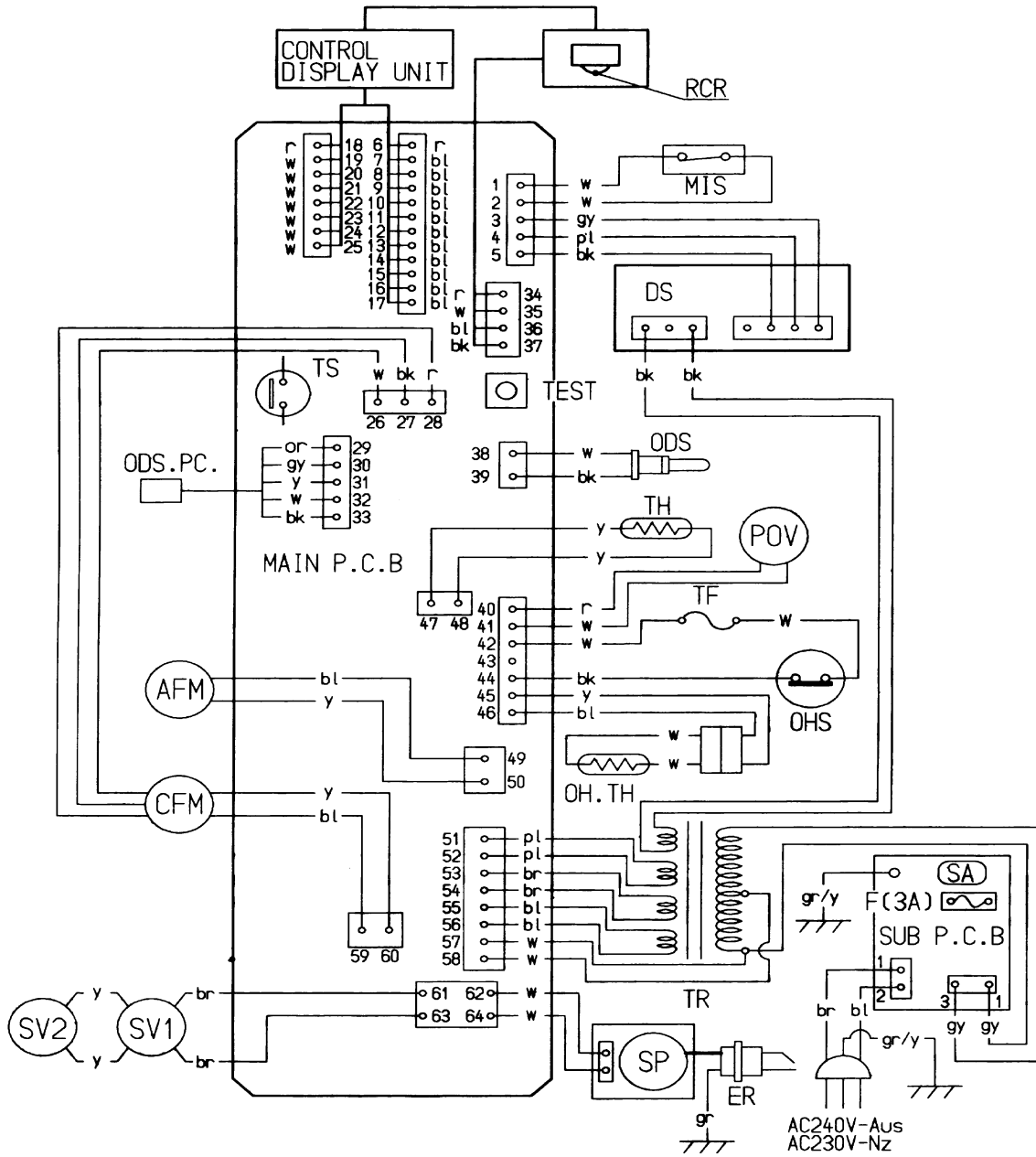


- c. Remove one (1) screw from gas tube upper.
- d. Disengage the gas supply tube (top and bottom).
- e. Remove the injector block and pull the injector free.

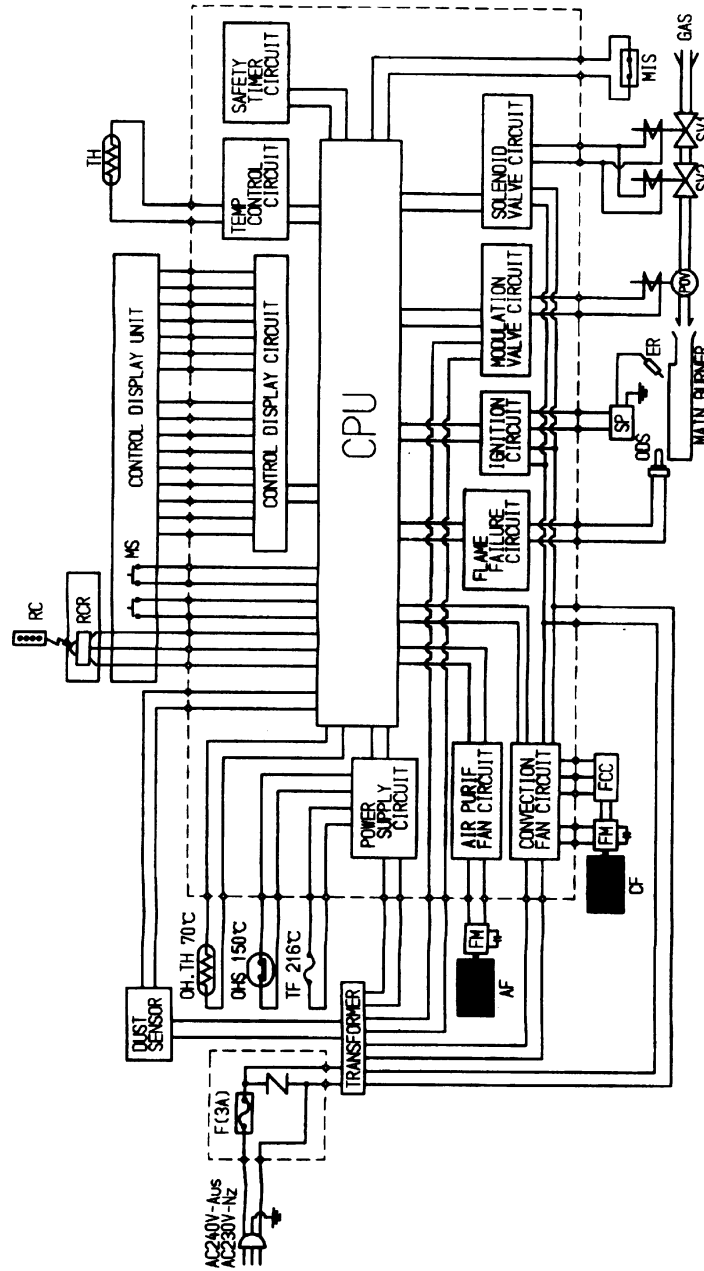
Note: Remove the o-rings and fit them onto the pipes before refitting.

# 18. Wiring Diagram

Legend				
bl: blue	r: red	w: white	y: yellow	v: violet
bk: black	gy: grey	or: orange	br: brown	gr: green

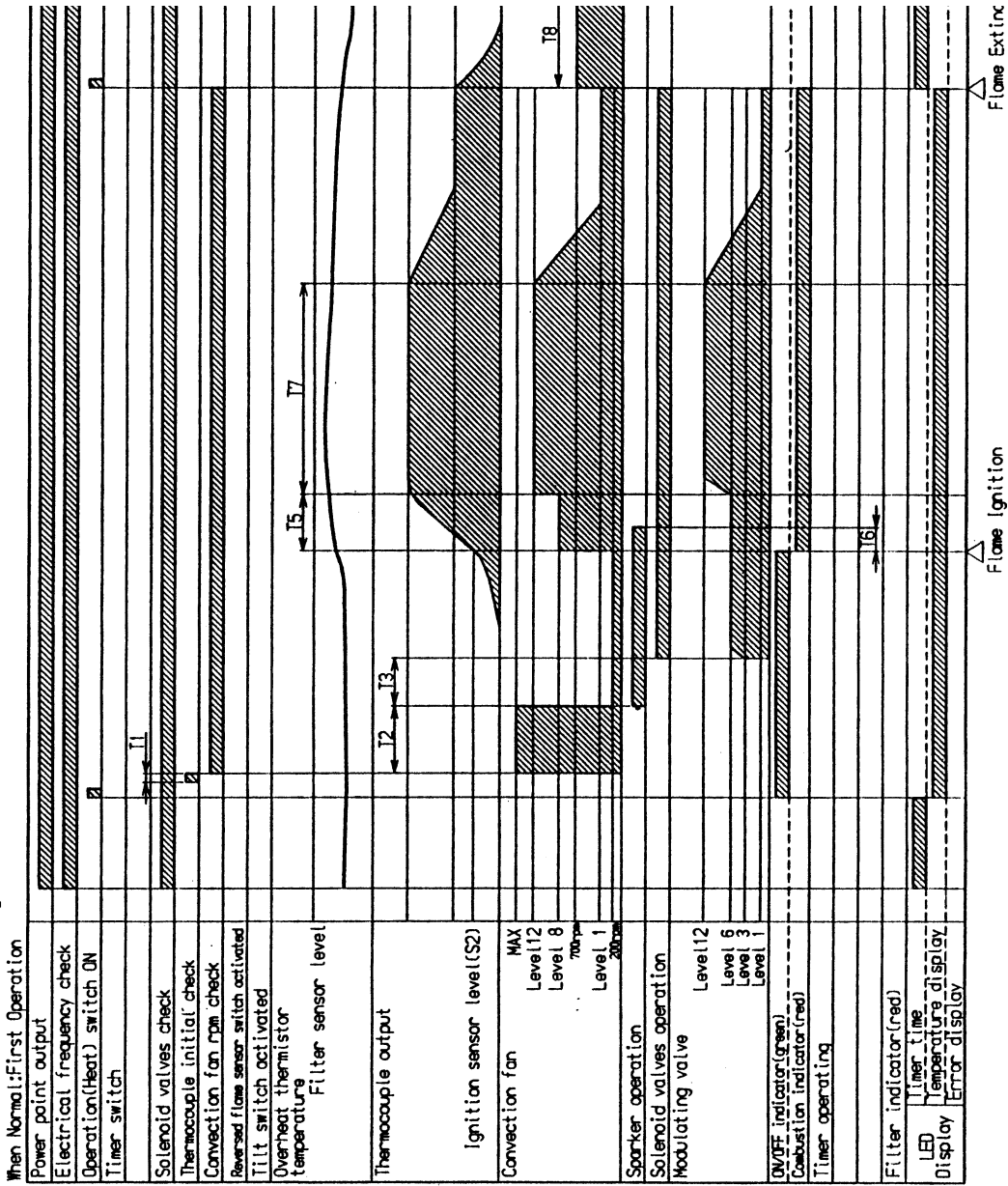


# 19. Block Diagram



# 20. Time Charts

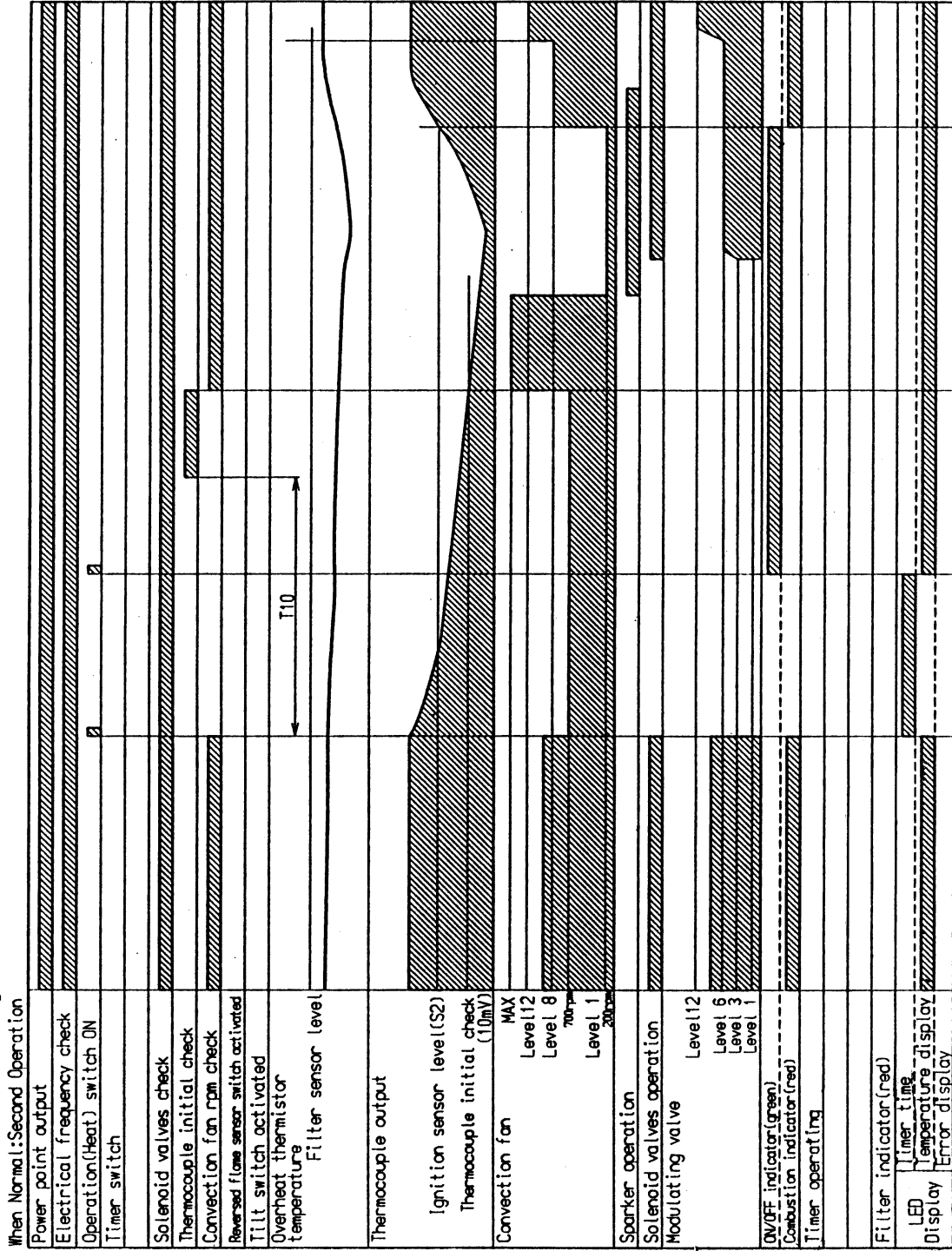
## RCE-460/560PTR (Heating)



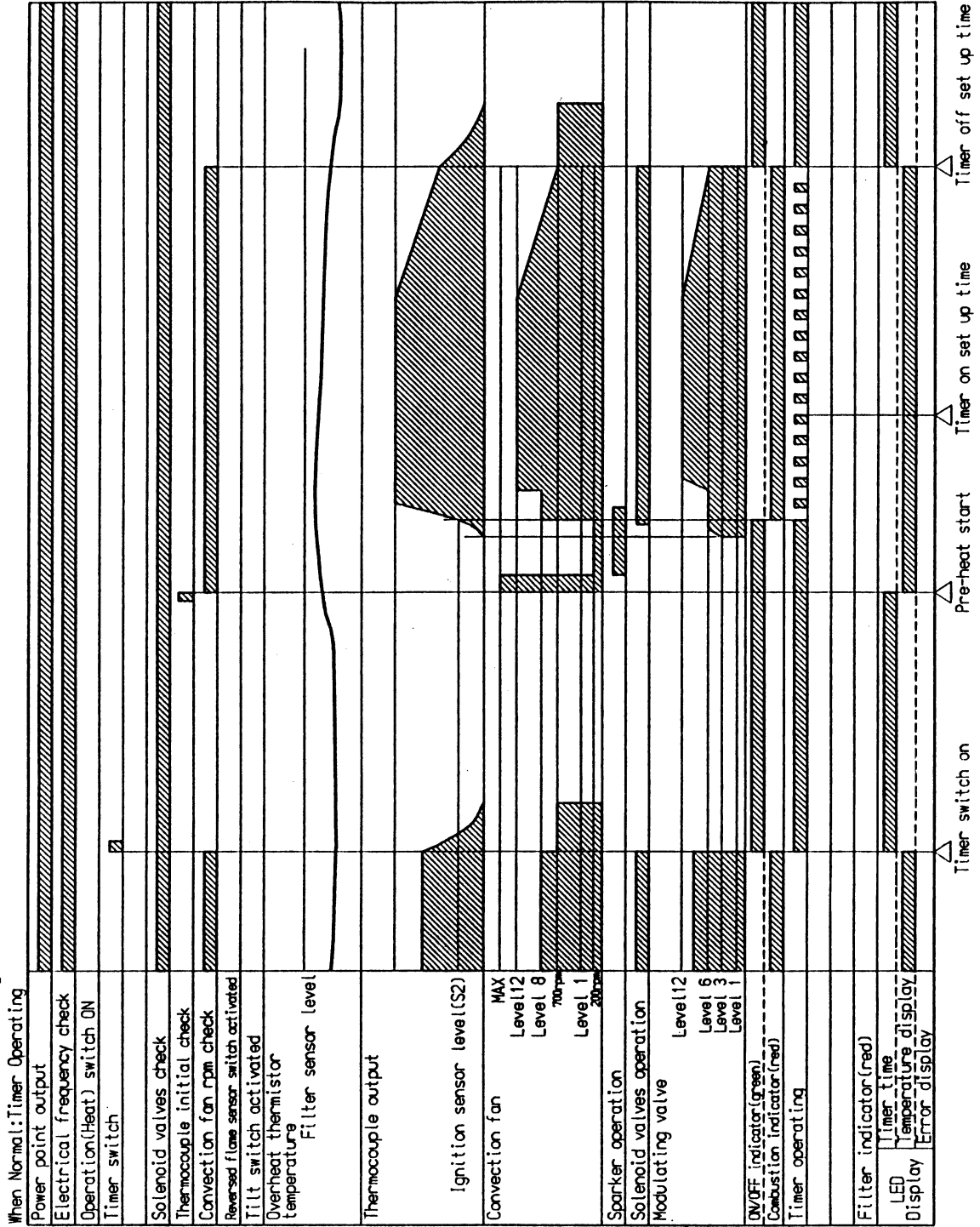
- Thermocouple ignition check: max:50sec.
- Timer switch: 10sec.
- Operation time 1: 0.1sec.
- Operation time 2: 1sec.
- Overheat thermistor: 50sec.
- Convection fan rpm check: 255sec.
- Reversed flame sensor switch activated: 255sec.
- Tilt switch activated: 150-255sec.
- Overheat thermistor: 20sec.
- Filter sensor level: 5sec.
- Thermocouple output: max:5sec.
- Ignition sensor level: 0.5sec.
- Convection fan: 15sec.
- Spark operation: 4sec.
- Solenoid valves operation: 10sec.
- Modulating valve: 0.2sec.
- ON/OFF indicator: 10sec.
- Combustion indicator: 0.2sec.
- Timer operating: 2sec.
- Filter indicator: 2sec.
- LED display: 2sec.
- Temperature display: 2sec.
- Error display: 2sec.

Convection fan is driven, if the fan level 6rpm within 10 seconds, it is ON, drive error and the unit cannot start.

RCE-460/560PTR(Heating).



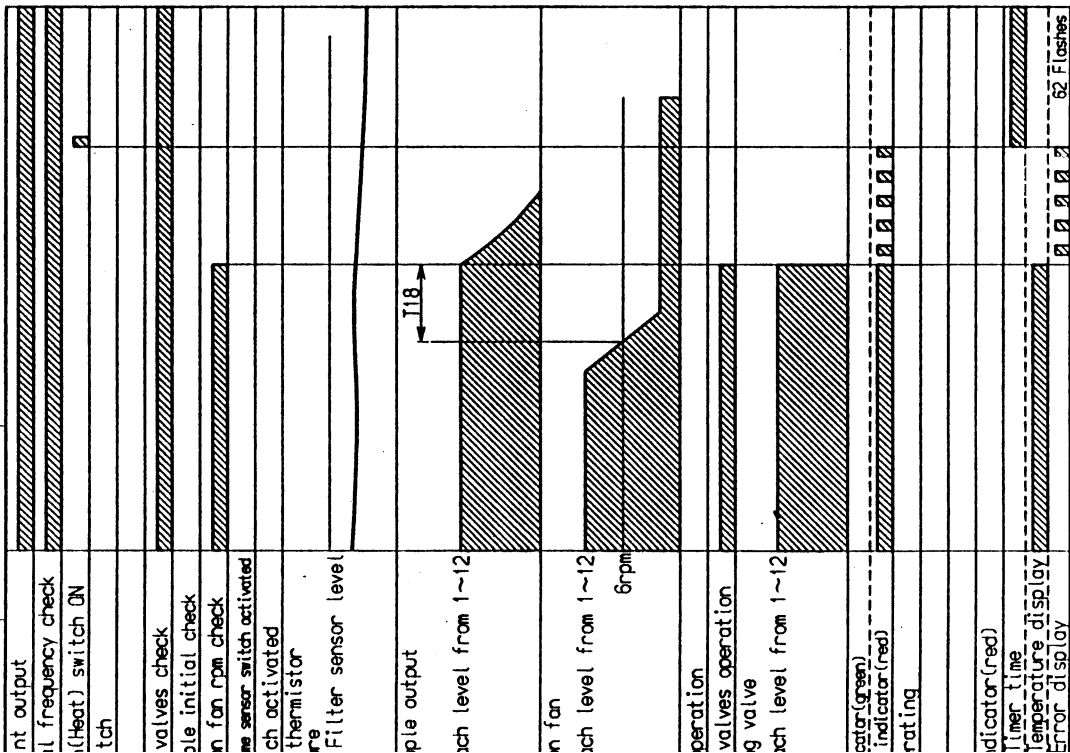
RCE-460/560PTR(Heating)





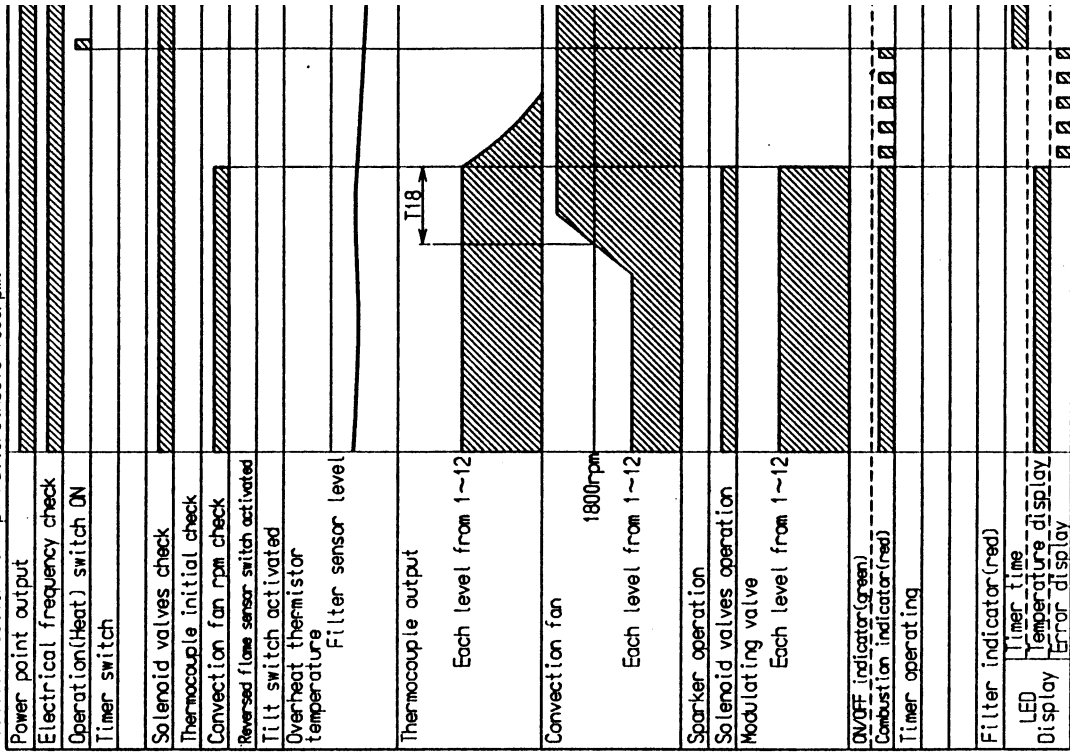
/560PTR(Heating)

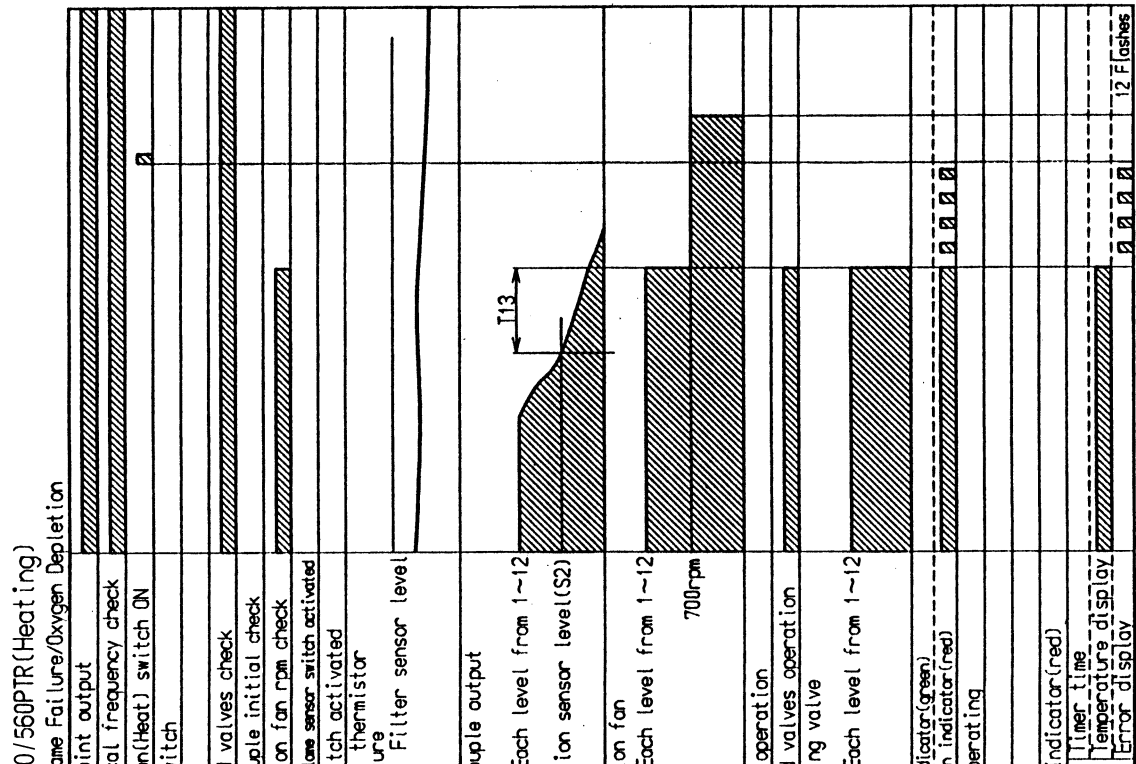
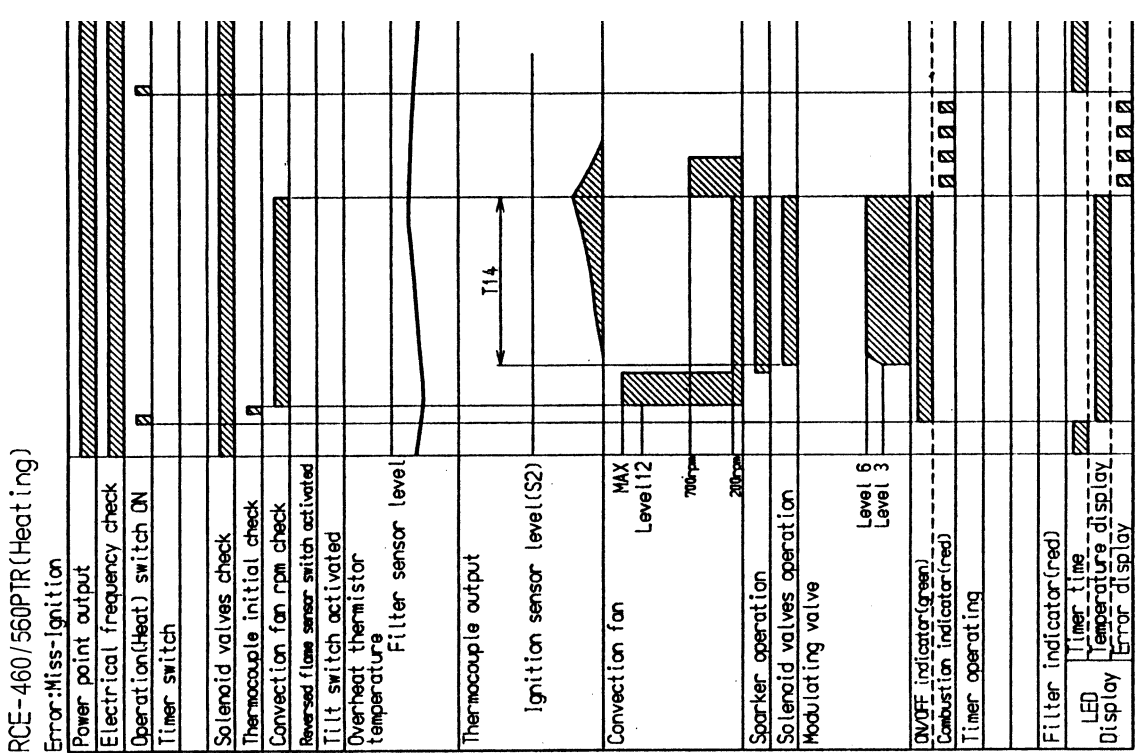
Convection Fan rpm Failure(Below 8rpm)



RCE-460/560PTR(Heating)

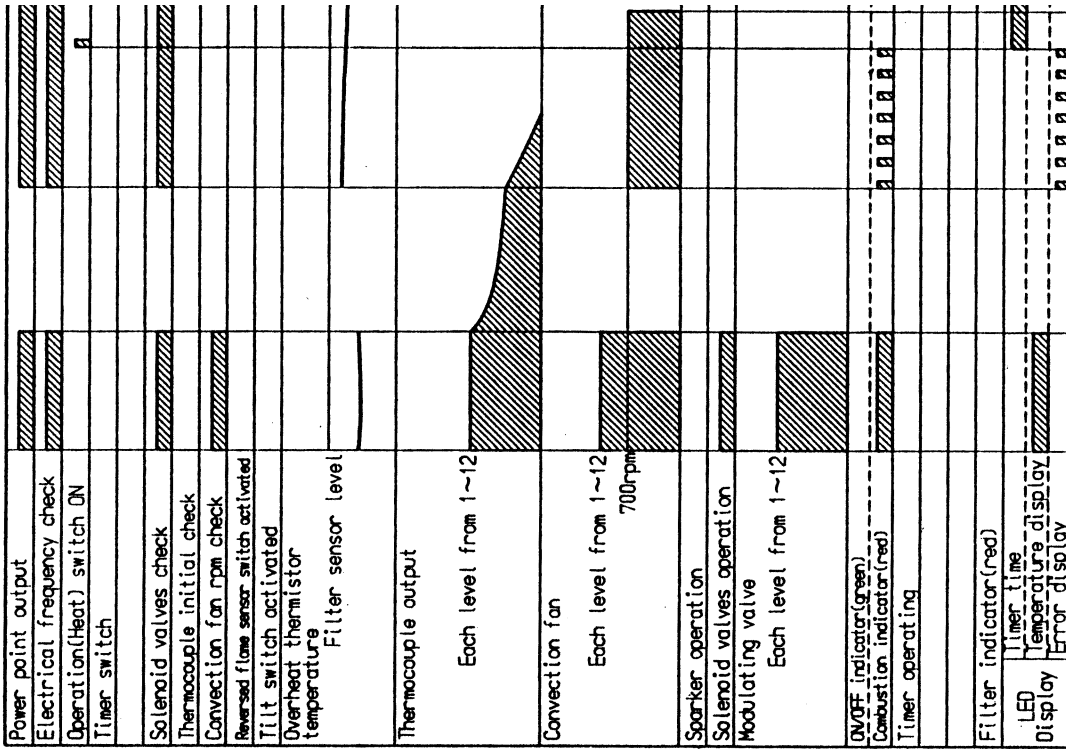
Fault:Convection Fan rpm Failure(Above 1800rpm)





RCE-460/560PTR(Heating)

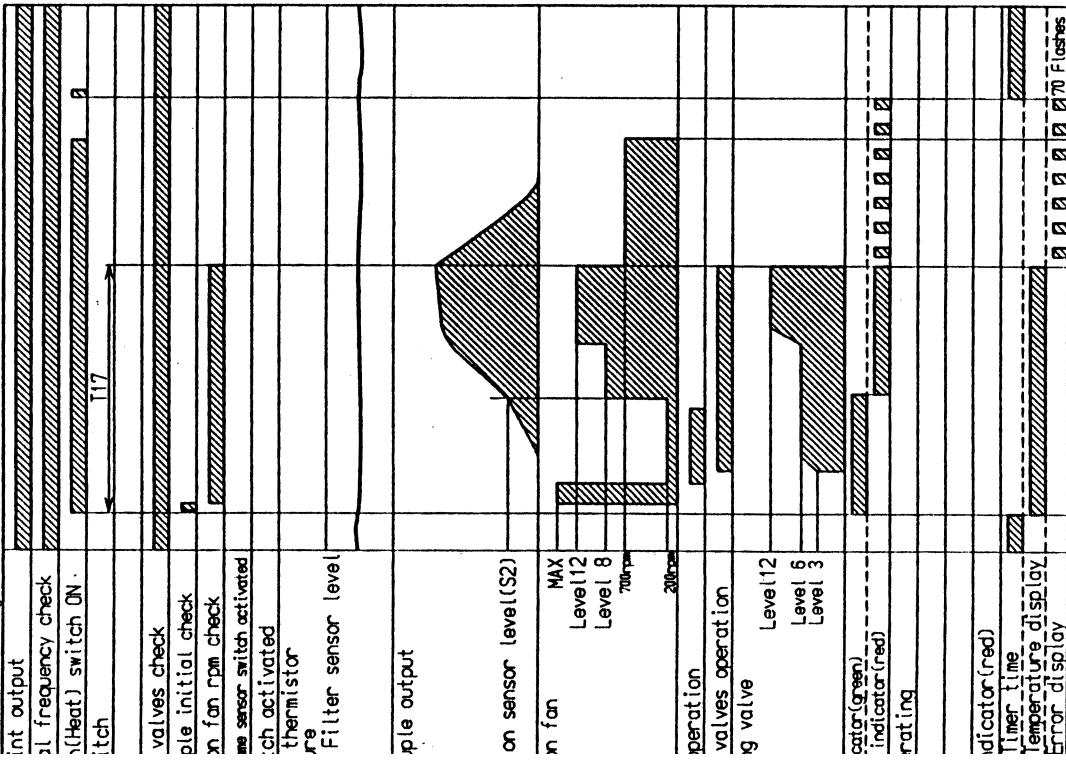
Fault:Power Failure



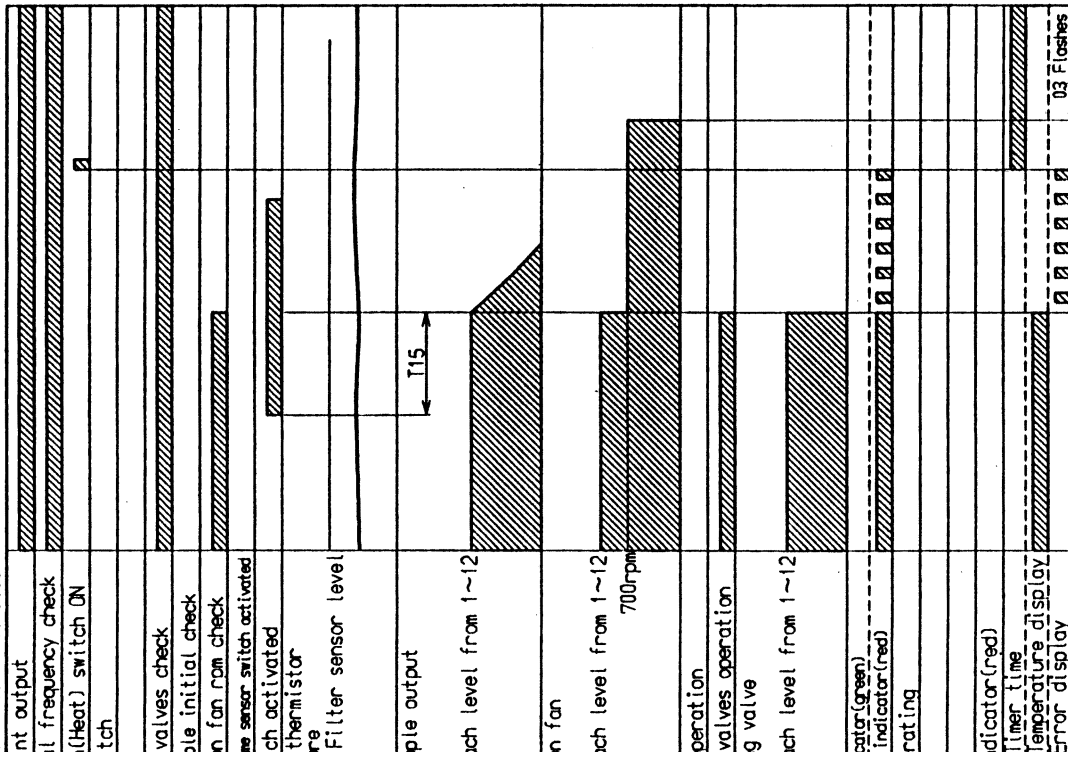
Power failure of at least 0.1 sec.

/560PTR(Heating)

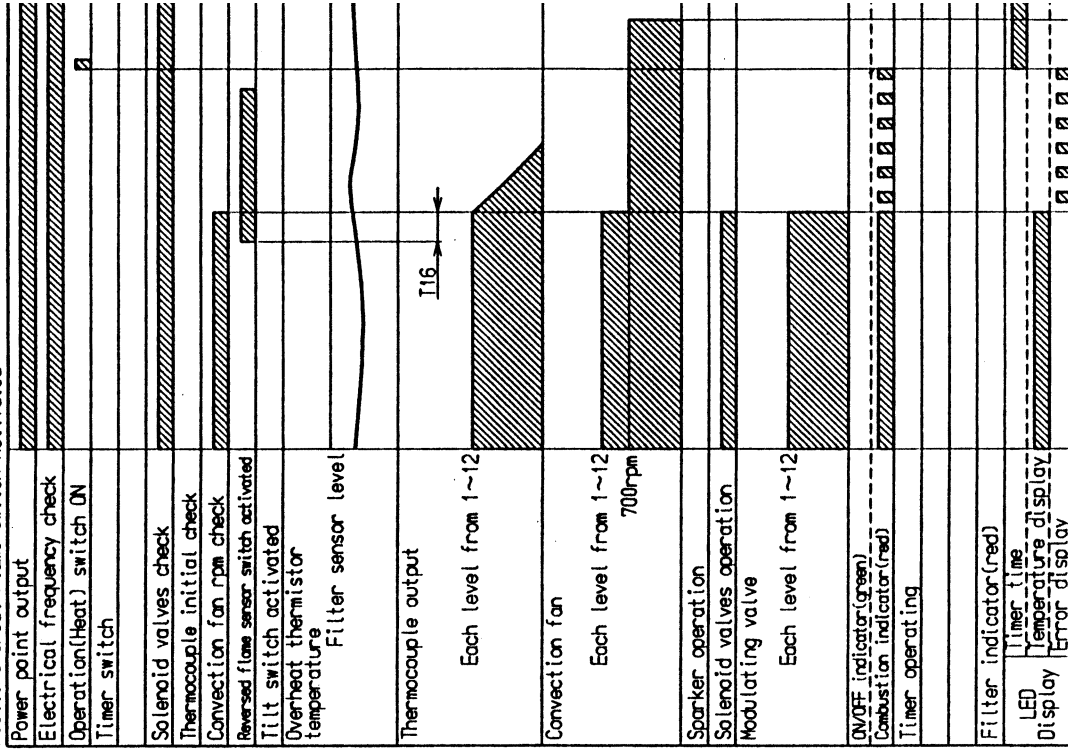
OFF Switch Failure



/560PTR(Heating)  
t Switch Activated

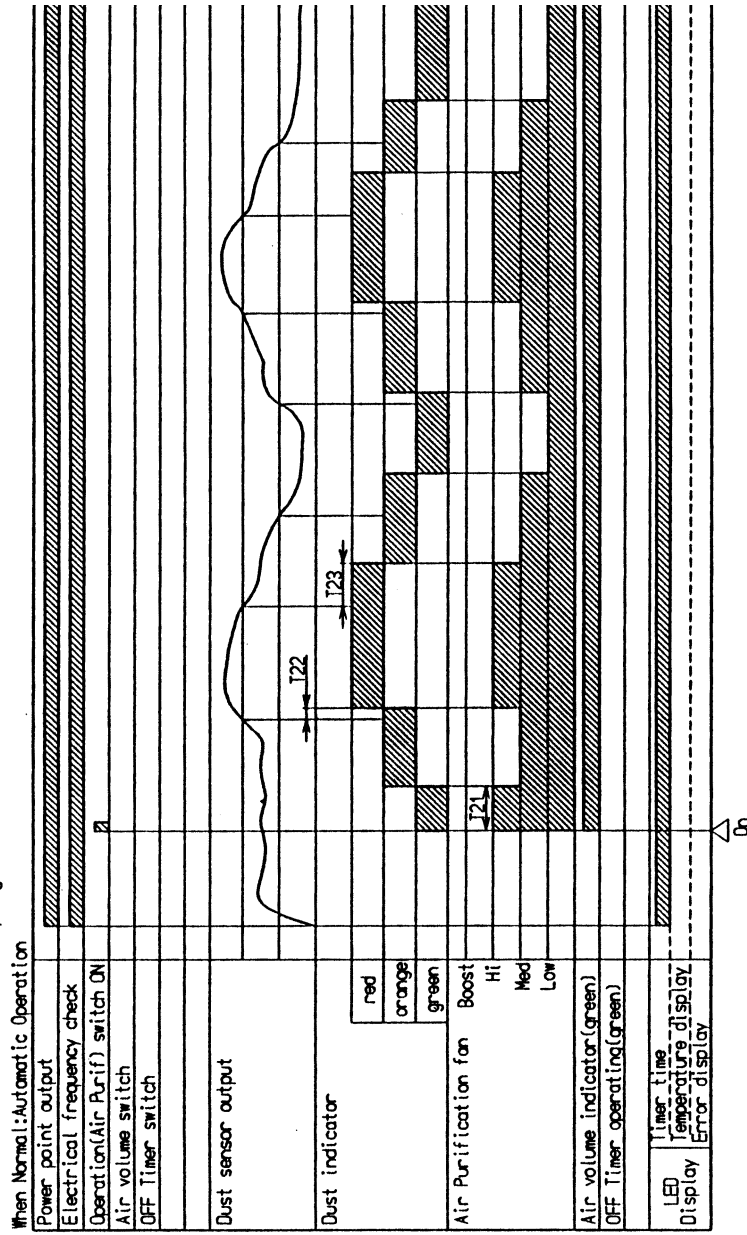


RCE-460/560PTR(Heating)  
Fault:Reversal Flame Switch Activated





RCE-460/560PTR(Air Purifying)



19sec.  
5sec.  
4min.

Time time  
a detect wait time  
a detect wait time

# SERVICE CONTACT POINTS

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Tel: (03) 9271 6666 Fax: (03) 9271 6611

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Tel: (02) 9609 2888 Fax: (02) 9609 5260

Tel: (02) 9729 0468

62 Elizabeth Street, Wetherill Park, NSW 2164

Tel: (02) 9609 2111 Fax: (02) 9609 5260

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